

Digitized by the Internet Archive
in 2025 with funding from
Boston Public Library

CLARK UNIVERSITY.

PRELIMINARY ANNOUNCEMENT.

The work of CLARK UNIVERSITY will begin in October next, in the following departments;

Mathematics, Physics, Chemistry, Biology and Psychology, with such additional facilities for the study of languages as scientific students may require.

This preliminary limitation of the wide academic field indicates no bias and no restriction of ulterior plans, but is adopted in the interests of more effective organization.

These departments will be gradually organized and sustained on the highest plain possible in existing conditions. No distinctively undergraduate classes will be formed, and no candidate for lower college classes will be received at first.

While not declining to confer the degree of A. B., the University will, for the present, give special attention to qualifying for higher degrees.

Ten fellowships of the first class of four hundred dollars each ; ten fellowships of the second class of two hundred dollars each, and ten scholarships with free tuition have been provided.

The rate of tuition has been fixed at two hundred dollars a year, exclusive of laboratory fees.

Applications can now be received and should be accompanied by a statement of the course of study and, if possible, by a specimen of work.

A prospectus containing fuller announcements will soon be issued.

All inquiries and applications should be addressed to the

Clerk of Clark University,
WORCESTER, MASS.

FRANK P. GOULDING,
Secretary of the Corporation.

G. STANLEY HALL,
President of the University.

Worcester, April 17, 1889.

CLARK UNIVERSITY,

WORCESTER, MASS.

First Official Announcement.

MAY 23, 1889.

TRUSTEES.

President,	-	-	JONAS G. CLARK.
Vice-Presidents,	-	-	CHARLES DEVENS.
			GEORGE F. HOAR.
			WILLIAM W. RICE.
Secretary,	-	-	FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark.	
Stephen Salisbury.	* Joseph Sargent.
Charles Devens.	John D. Washburn
George F. Hoar.	Frank P. Goulding.
William W. Rice.	George Swan.

COMMITTEES.

FINANCE.	BUILDINGS.
Jonas G. Clark.	Jonas G. Clark.
Stephen Salisbury.	* Joseph Sargent.
John D. Washburn.	Stephen Salisbury.

BY-LAWS.

Jonas G. Clark.
 William W. Rice.
 John D. Washburn.
 Stephen Salisbury.
 George Swan.

James P. Hamilton, - - - Cashier.

* DIED OCTOBER 12, 1888.

CLARK UNIVERSITY.

FIRST OFFICIAL ANNOUNCEMENT.

The Founder.

Clark University was founded by the munificence of a native of Worcester County, whose plans, conceived more than twenty years ago, have gradually grown with his fortune. His affairs have been so arranged as to allow long intervals for travel and study. During eight years thus spent, the leading foreign institutions of learning, old and new, were visited, and their records gathered and read. These studies centered about the means by which the highest culture of one generation is best transmitted to the ablest youths of the next, and especially about the external conditions most favorable for increasing the sum of human knowledge. To the improvement of these means and the enlargement of these conditions, the new University will be devoted.

His Desire.

It is the strong and express desire of the founder that the highest possible academic standards be here forever maintained; that special opportunities and inducements be offered to research; that to this end the instructors be not over-burdened with teaching or examinations; that all available experience, both of older countries and our own, be freely utilized, and that new measures, and even innovations, if really helpful to the highest needs of modern science and culture, be no less freely adopted; in fine, that the great opportunities of a new foundation in this land and age be diligently explored and improved.

He has chosen Worcester as the seat of the new foundation after mature deliberation—first;

Because its location is central among the best colleges of the East, and by supplementing rather than duplicating their work, he hopes to advance all their interests and to secure their good will and active support, that, together, further steps may be taken in the development of superior education in New England; and secondly;

Because he believes the culture of this city will ensure that enlightened public opinion indispensable in maintaining these educational

standards at their highest; and that its wealth will ensure the perpetual increase of revenue required by the rapid progress of science.

The Board of Trustees.

As the first positive step towards the realization of these long-formed plans, Mr. CLARK invited the following gentlemen to constitute with himself a Board of Trustees:

STEPHEN SALISBURY,

A. B., Harvard, 1856; Universities of Paris and Berlin, 1856-58; Harvard Law School, 1859-61; President Antiquarian Society since 1887.

CHARLES DEVENS,

A. B., Harvard, 1838; Harvard Law School, 1840; Major-General, 1863; Judge of Supreme Court, 1857; United States Attorney General, 1877-81; LL.D., Columbia and Harvard, 1877; Judge Supreme Court since 1881.

GEORGE F. HOAR,

A. B., Harvard, 1846; Harvard Law School, 1849; United States House of Representatives, 1868-76; United States Senate since 1876; LL.D., William and Mary, Amherst, Harvard and Yale.

WILLIAM W. RICE,

A. B., Bowdoin, 1846; admitted to Bar, 1854; United States House of Representatives, 1876-86; LL.D., Bowdoin, 1886.

* JOSEPH SARGENT,

A. B., Harvard, 1834; M. D., Harvard, 1837; London and Paris Hospitals, 1838-40,

* Died October 12, 1883.

JOHN D. WASHBURN,

A. B., Harvard, 1853; Harvard Law School, 1856; Representative, 1876-9; State Senate, 1887; United States Minister to Switzerland, 1889.

FRANK P. GOULDING,

A. B., Dartmouth, 1863; Harvard Law School, 1866; City Solicitor since 1881.

GEORGE SWAN,

A. B., Amherst, 1847; admitted to Bar, 1851; Member of Worcester School Board since 1879; Chairman of High School Committee.

A charter was granted early in 1887. Land and other property that had been before secured by the founder was transferred to the Board, and the erection of a central building was begun.

The President and his Duties.

In the Spring of 1888, G. STANLEY HALL, then a professor at the Johns Hopkins University, was invited to the presidency. The official letter conveying this invitation contained the following well-considered and significant expression of the spirit animating the Trustees:

“They desire to impose on you no trammels; they have no friends for whom they wish to provide at the expense of the interests of the institution; no pet theories to press upon you in derogation of your judgment; no sectarian

tests to apply; no guarantees to require save such as are implied by your acceptance of this trust. Their single desire is to fit men for the highest duties of life, and to that end, that this institution, in whatever branches of sound learning it may find itself engaged, may be a leader and a light."

The President was at once granted one year's leave of absence, with full salary, to visit universities in Europe. This year was diligently improved and a report of its work will be made later.

The duties of this office have been thus defined by the Trustees, May 23, 1889.

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University, and attend the meetings of the Board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other

property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

Professors and Special Departments.

The plans of the University have now so far progressed that work will begin, in October next, in MATHEMATICS, PHYSICS, CHEMISTRY, BIOLOGY and PSYCHOLOGY.

These departments are provisionally arranged below in the order, not of prominence or completeness with which they will be organized at the opening, but only in the order of fullness with which announcements are now ready.

PSYCHOLOGY.

The President of the University has been appointed temporary professor of Psychology, and will continue, so far as other engagements will permit, to direct the work of this department as formerly at the Johns Hopkins University. By instruction or seminars, or by careful personal conference and guidance to the best literature, and with the aid of Dr. SANFORD, attention will be directed to the following topics:

The general properties of the nervous substances; the psycho-physiology of each of the special senses and their defects; the perception of time and space; the time-sense; the psychophysic law; mental images (morbid and normal) and their associations; the leading topics in the psychology of insanity, especially aphasia, illusions and hallucinations, melancholia, neurasthenia, epilepsy, hysteria, mania and paralysis; instinct; the psychology of language; myth, custom and belief anthropologically considered; hypnotism, and the psychological side of the history of philosophy, especially the Greek, German and English systems.

Dr. HALL will also direct the work of a few students of class III (below) in the history, methods and organization of education, elementary, intermediate and superior. On these topics he will give a special course of lectures during a part of the year.

Opportunities in psychology will be supplemented by work in the biological department and especially by that of Dr. DONALDSON. A well equipped laboratory of apparatus for research in the various departments of experimental psychology will also be opened in October.

Opportunities for prompt publication of meri-

torious investigations, together with digests of current literature in this department will be found in *THE AMERICAN JOURNAL OF PSYCHOLOGY*, which is published under the editorial care of Dr. HALL.

HENRY H. DONALDSON has been appointed assistant professor of Neurology. Dr. DONALDSON graduated from Yale College in 1879. After spending a year at the Sheffield Scientific School and another at the College of Physicians and Surgeons in New York City, he was appointed a fellow of Johns Hopkins University for two years, receiving the degree of Doctor of Philosophy there in 1885. A year and a half was then spent in Europe, chiefly with Professors Gudden at Munich, Foral at Zurich, and Golgi at Turin, and on returning he was appointed associate in psychology in the Johns Hopkins University.

Dr. Donaldson is author of the following researches: "On the Detection and determination of Arsenic in Organic Matter." (*Am. Chemical Jour.* Vol. II, No. 4.) "The Influence of Digitaline on the work of the Heart and on the flow through the Blood-vessels." (*Jour. of Physiology.* Vol. IX, No. 2.) "Motor Sensations of the Skin." (*Mind* No. XL.) "On the Temperature-Sense." (*Mind* No. XXXIX.) "On the Relation of Neurology to Psychology." (*Am. Journal of Psychology*, Vol. I, 1888.

Dr. DONALDSON will give instruction in the finer anatomy of the central nervous system in

man, in the histology of the sense-organs in the vertebrate series and the localization of function in the brain, together with such other topics as may serve to facilitate study in these lines.

Lectures, laboratory work, conferences &c., will be offered.

Those desiring further information concerning leading works of reference, or the equipment of the laboratory, can address Dr. DONALDSON during the summer at Worcester.

EDMUND CLARK SANFORD, who has been appointed instructor in Psychology, graduated from the University of California in 1883. He has since spent four years at the Johns Hopkins University, where he was appointed fellow in psychology in 1887, and received the degree of Doctor of Philosophy the following year. The past academic year has been spent as instructor in the undergraduate department of the Johns Hopkins University, and in editing, under Dr. HALL's supervision, *THE AMERICAN JOURNAL OF PSYCHOLOGY*.

Dr. Sanford is author of the following original studies: "The writings of Laura Bridgman," two articles in the *Overland Monthly*, 1886-7. "The Relative Legibility of the Small Letters," (*Am. Jour. of Psy.*, May, 1888.) "Personal Equation," three articles in the *Am. Jour. of Psy.*, Nov. 1888; Feb. and May 1889.

Dr. SANFORD will give the two following special courses:

First half year: the Physiological Psychology of Vision; monocular vision, color perception, contrast, etc.; binocular vision, stereoscopy, and the horopter, perception of space, nativism and empiricism. Chief authorities, Helmholtz, Hering, Wundt. The aim will be to demonstrate all the important experiments mentioned in the course, with suitable apparatus.

Second half year: the Application of Time-Measurements to Psychology; simple and complicated reaction-times, personal equation, association-times, and time-sense.

Dr. SANFORD will also assist Professor HALL in the work of instruction and in the direction of the psycho-physic laboratory, seminary, etc.

It is hoped that fuller opportunities for the study of historical philosophy, logic and ethics may eventually be offered.

The work of the Psychological department is intended for the following classes of students: those who desire to teach philosophy in any or all of its departments: physicians or medical students who wish to become specialists in the treatment of insanity or of diseases with nervous complications; those who desire to study educa-

tion professionally (and who are advised to give most of their energy to psychology, which is its chief scientific basis, pedagogy being a field of applied psychology).

Some of the special topics into which the work above naturally falls can be attended as a special course by students of other departments. Thus students of biology or pathology may follow the histological course of Dr. DONALDSON; students of classics may follow the course in Greek philosophy; of morphology, the lectures on instinct; of astronomy, the lectures on reaction-time and the personal equation.

BIOLOGY.

In this department WARREN P. LOMBARD was appointed assistant professor of Physiology in August, 1888.

Dr. LOMBARD graduated from Harvard College in 1878, and from Harvard Medical School in 1881. In 1881-2 he was prosector and lecturer in the College of Physicians and Surgeons in New York City, and for the next three years, 1882-5, attended lectures and was engaged in research work in Germany, chiefly in the laboratory of Professor Ludwig, in Leipsic. The next three years were devoted to research and to the duties of lecturer and assistant in physiology

at the College of Physicians and Surgeons and elsewhere. The present year is being spent in the laboratories of Professors Dastre and Darsenval of Paris, Professor Mosso of Turin and elsewhere.

Dr. Lombard is the author of the following researches in his department: *Beiträge zur Theorie der Wärmempfindung. Vorläufige Mittheilung* (Centralb. f. d. Med. Wis. No. 32, 1883.) "Die räumliche und zeitliche Aufeinanderfolge reflectorisch contrahirter Muskeln." (*Arch. f. Anat. u., Physiol.* 1885, p. 408.) "The Variations of the Normal Knee Jerk." (*Am. Jour. of Psychol.*, Oct. 1887.) "The Influence of Temperature on Voluntary Muscular Contraction in Man." (March, 1889.)

Work in this department will be conducted with the aid of lectures, laboratory, conferences, etc., and will cover the physiology of digestion, secretion, respiration, circulation, the nerves, muscles and senses. The laboratory will be well furnished with instruments and other appliances for investigation in each of these special fields.

A more detailed announcement of Dr. LOMBARD'S work will soon be made.

F. MALL has been appointed adjunct professor of anatomy. Dr. MALL graduated from the University of Michigan in 1883, where he received the degree of M. D. He studied one year with Professor Kuhne at Heidelberg, and two years

with Professors Weigert, His and Ludwig in the University of Leipsic. Since 1886 he has been, successively, fellow, instructor and associate in pathology, in the Johns Hopkins University.

Dr. Mall is the author of the following researches, among others, in his department: "Entwicklung der Branchial bogen und Spalten des Hünchens. His und Bräune, Archiv. 1887. Blut und Lymphwege im Dünndarme des Hundes. Abhandl. der Säch. Ges. d. Wiss., Bd. XIV. "Development of the Ear of the Chick." Studies from the Biolog. Lab., J. H. U., 1888. "The Bronchial Clefts of the Dog." Studies from the Biolog. Lab., J. H. U., 1888. "Reticulated and Yellow Elastic Tissues." Anatomischer Anzeiger, 1888.

Dr. MALL will offer two courses, one in histology, and one in vertebrate embryology. Each of these may be divided into two courses, one theoretical and practical for beginners, three times a week, in the afternoon, and one consisting of laboratory work (9 A. M. to 5 P. M.) for advanced students.

Journals and apparatus will be ready in October.

PHYSICS.

ALBERT A. MICHELSON has been appointed acting professor of Physics. DR. MICHELSON graduated at the United States Naval Academy in 1873, where he afterwards served as instructor in physics and chemistry for four years. He was later attached to the Nautical Almanac

office, in Washington. For two years, beginning in 1880, he worked in Europe under Helmholtz, Quincke, Mascart and Cornu. On returning, he resigned his commission of master (now called lieutenant) in the navy, and became professor of physics in the Case School of Science, Cleveland, Ohio, where he has since remained. In 1888 he was awarded the Rumford medals for his researches on the velocity of light. Dr. MICHELSON is a member of the American Academy of Science, corresponding member of the British Association, Vice-President of the American Association for Advancement of Science, &c.

The following are the titles of some of his Memoirs: "Experimental Determination of the Velocity of Light." I (Proc. A. A. S. 1879.) "Experimental Determination of the Velocity of Light." II (Proc. A. A. S. 1880.) "A Method for Determining the Rate of Tuning Forks." (Am. Journal, January, 1883.) "Experimental Determination of the Velocity of Light." (Astr. Papers of the Nautical Almanac, Vol. II.) "Velocity of Light in Carbon Disulphide and Velocity of Red and Blue Light in same." (Ibid. Vol. II.) "The Relative Motion of the Earth and the Luminiferous Ether." (Am. Journal of Science, August, 1881.) "A New Sensitive Thermometer." (Journal de Physique, 1882.) "Interference Phenomena in a New Form of Refractometer." (Am. Journal, May, 1882.) "M. Wolf's Modifications of Foucault's Apparatus for Measuring the Velocity of Light" (Nature, May 7, 1885.) "Influence of Motion of the Medium on the Velocity of Light." (Am. Jour., May, 1886.) "On the Relative Motion of the Earth and the Luminiferous Ether." (Phil. Mag., November 1887.) "On a Method for Making the Wave Length of Sodium Light, the Absolute and Practical Standard of Length." (Am. Jour. December, 1887.) "On the

Feasibility of Establishment of a Light Wave as the Ultimate Standard of Length." (Not yet published)

Professor MICHELSON will give a course of illustrated and experimental lectures in physics, extending through two years. These will treat the chief topics in this department, and will be sufficiently advanced for students intending to make physics a specialty, and will be interspersed by examinations and conferences.

This course will be supplemented by a series of lectures or readings in theoretical optics, electricity and magnetism, or in thermodynamics of a more informal nature. Students with a fair knowledge of integral and differential calculus will have no difficulty in following this course.

A graded course of laboratory instruction will be offered for practical acquaintance with special methods. Dr. MICHELSON will strive, by advice and example, to encourage a spirit of diligent investigation and original research, particularly in those intending to find their life work in this department.

This plan is subject to modification, and a fuller announcement will be made later.

CHEMISTRY.

The organization of no department will probably be more complete than this in October.

A large laboratory of about fifty rooms will be ready for occupation and the names of some of the instructors can be very soon announced. Applications of students can now be received.

MATHEMATICS.

Appliances for this department are also liberally ordered; the names of instructors will soon be announced.

The organization of all of the above and of other departments will be gradual, and the foundation-period of the University will cover some years.

Apparatus is being extensively ordered of the best makers in this country and in Europe, chiefly from those who devote themselves to the special class of apparatus in which they excel.

The instructors in each department will make timely provision for all their needs, and are also requested to furnish lists of desired books and periodicals.

Methods.

Besides field work, excursions to institutions public and private, coaching and cram-classes, examinations, conferences and other modes by which knowledge now seems best imparted and retained, the following educational methods will probably be prominent:

Seminaries. These are stated, perhaps weekly, meetings, often in a department library, for joint, systematic, but conversational work, under the personal direction of the professor, in some special chapter of his subject. Here the results of individual reading are reported for the benefit of all; views are freely criticised; new inquiries, methods, comparisons, stand-points, etc., suggested. From the mutual stimulus thus given many important works have proceeded, and the efficiency of universities, especially in Germany where seminaries were first generally introduced, has been greatly increased.

Laboratory Work. For beginners this was from the first the best of all forms of apprenticeship, bringing student and professor to a far closer and mutually stimulating relation. Here the manipulation of apparatus is learned, each well-chosen piece of which is an obvious epitome of long lines of research, processes are criticised, results obtained by other investigators are tested, methods are discussed and perfected. The modern laboratory has thus become an unexcelled school of logical mental discipline, from which is developed, as its best product, that rare independence in research which is the consummation of scientific culture.

Lectures. The Trustees desire that each instructor, of however few students, should prepare and deliver regular lectures, with diagrams, illustrative apparatus and references to standard text books, and the best current literature upon each topic. Advanced students and instructors will also be encouraged to supplement the work of the professors by giving special lectures and courses. Public lectures will from time to time be given.

Classes of Students.

The following classes of students will be admitted :

I. *Independent Students:*

This class will include those who have already taken the doctorate or other academic degrees in this country or abroad, and others of sufficient training who have time that may be devoted to particular lines of study or research.

For competent men of this class, individual arrangements may be made, and an independent room, and even special apparatus and books, provided that they may pursue their investigations, either alone or with the aid and counsel of the instructors, to the best advantage.

Conditions under which a few of the most advanced students of this class can be granted the *venia docendi*, as lecturers or docents, are under careful consideration.

It is hoped that some of the permanent instructors of the University may be recruited from this class.

It is probable that a few of these mature students can be received, not only in the five departments named above, but in others soon to be organized, and in the development of which they may co-operate.

II. *Candidates for the Degree of Doctor of Philosophy.*

Those qualifying for this degree will be matriculated early in the fall, after suitable tests, which will also aid in determining when they can be admitted to the final examination.

The full course provided for this class of students will be three years, but admission to advanced standing at the outset is possible, and those found to be qualified may be allowed to take the doctor's examination in two years, or even one.

It is to the needs of these students that the lectures, seminaries, laboratories and collections

of books and apparatus will be especially shaped, and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the fellowships and scholarships are primarily intended, although any of these honors may be awarded to students in classes I or III.

III. *Special students not candidates for a degree.*

This class includes those who may desire to devote themselves exclusively to one or more of the special branches—mathematics, physics, chemistry, biology or psychology—but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects) may be allowed entire freedom in their choice and combination of studies, and, as special students, may enjoy all the privileges of the University.

IV. *Medical Students.*

The University offers special facilities in those fundamental disciplines upon which the study of medicine in all its departments now rests.

Thus, students of sufficient preliminary training can be admitted in the departments of chemistry, biology, anatomy, physiology and neurology, and receive here the purely scientific part of a medical education.

V. *Preliminary candidates or undergraduates.*

Non-university students of less special, or less advanced standing than the above four classes, who are nearly, but not quite, qualified to become candidates for the degree of doctor of philosophy, may also be received.

Students of this class must for the present have completed the work of the first three, or at least of the first two, years of a regular undergraduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University that they can proceed to the degree of A. B. in one year and contemplate advancing to a higher degree. The privileges and status of these students will be more fully defined later. They may be elected to scholarships, but not to fellowships.

Fellowships and Scholarships.

To no form of educational gift or bequest have probably so many people contributed as to

the various forms of individual aid to meritorious students.

Under the names of bursaries, stipends, exhibitions, prizes, benefices, etc., as well as of scholarships and fellowships, the revenues of foundations established by and bearing the names of sometimes hundreds of donors in a single university, are annually distributed.

Sometimes these funds were given by men or women themselves not far removed from need, and are appointed to furnish a student with firewood, a room, a bed, one daily meal, or a coat each year, etc., and sometimes yielding one or two thousand dollars to a single holder. Often many students were provided by a single donor, and some of these European foundations, even the smallest, are centuries old, so sacredly are they guarded, and others are even now being established.

The more advanced the education the more such aids are needed, and the more numerous and substantial do they in fact become in Europe.

So great is now the need of bringing the best intellects to fullest maturity, and so increasingly necessary for the highest scientific attainment are now the leisure, tranquillity, books and appa-

tus thus best supplied, that the demand is strong for still more and greater aids of this kind for advanced and competent students.

Several of the wisest governments in Europe, recognizing that the modern world and its rulers are ruled by experts thus best trained, vie with private munificence in supplying such aids.

With a deep sense of the peculiar needs of our country in this respect, the founder of this University and his wife have provided such opportunity and incentive here as follows :

In addition to all previous gifts of the donor, and apart from the permanent funds of the University, full tuition of two hundred dollars each for thirty meritorious students will be paid into the treasury. For eight of these students, thus freed from tuition, Mr. Clark has also established fellowships yielding each holder four hundred dollars per annum, and eight more fellowships yielding each holder two hundred dollars per annum. These, with eight free scholarships as above provided, will be known as the JONAS G. CLARK SCHOLARSHIPS and FELLOWSHIPS respectively.

Mrs. Clark has established two fellowships yielding four hundred dollars each, and two fel-

lowships yielding two hundred dollars each per annum. These, with the two remaining scholarships, will be known as the MRS. JONAS G. CLARK FELLOWSHIPS and SCHOLARSHIPS respectively.

These six latter are especially provided for the department of psychology, while the 24 presented by Mr. Clark are to be distributed among the other four departments at the discretion of the president and faculty.

The founder and his wife unite with the trustees and president in inviting sympathy and practical co-operation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

Both scholarships and fellowships are open only to students in one or more of the five departments announced, and are renewable annually. They are designed to encourage promising young men, graduates of colleges and others who have developed a preference for particular lines of study in which they desire to attain still further proficiency.

While intended to remove pecuniary hindrances in the way of such students, both scholarships and fellowships are primarily honors, awarded without reference to pecuniary needs. Thus, those desiring to do so may relinquish

the emolument and retain the title of scholar and fellow.

Residence in Worcester, during University sessions, and work under the general direction of the heads of departments is required. Those appointed to these honors must, unless by special arrangement, be under the age of thirty-five, and must devote themselves to scientific or liberal, instead of to industrial or professional studies. They should work in a spirit of hearty co-operation with their instructors and of genuine devotion to science.

Applications can now be received, and may be accompanied by diplomas, testimonials, and a brief statement of the course of study. Those applying for fellowships, especially of the first class, should also, if possible, submit some specimen of their work, in writing or in print.

Appointments will be made from time to time during the coming summer and fall. Private announcements will be sent to successful candidates, and no publicity will be given to the names of those not appointed.

Location.

The University is situated in Worcester, the third city of New England in size, with 80,000

inhabitants. It is one hour westward from Boston by rail, and five hours from New York city. Central among the best New England colleges, the location is most favorably chosen for attempting the next step in the higher university development of the country.

Worcester is also the seat of the following institutions of an educational character.

THE AMERICAN ANTIQUARIAN SOCIETY, an institution of national character and repute, organized in 1812, with a library of 85,000 volumes, possessing funds and collections, and issuing publications of its own.

THE WORCESTER FREE PUBLIC LIBRARY, containing about 75,000 volumes and receiving about 250 periodicals.

THE WORCESTER POLYTECHNICAL INSTITUTE, incorporated in 1865, with three large and well appointed buildings, fifteen instructors and a three years' course mainly in the sciences and their application to the practical arts.

THE WORCESTER LYCEUM AND NATURAL HISTORY ASSOCIATION, incorporated in 1866, and containing extensive local collections.

THE COLLEGE OF THE HOLY CROSS, a Catholic

institution of high grade, incorporated in 1865, and with a corps of fifteen instructors.

In addition to these may be mentioned a law library of 12,000 volumes; a medical library of 8000 volumes; a State Normal School with a two years' course, eight instructors and about two hundred students; one high school; the Highland Military Academy, founded in 1858, with seven instructors; the Worcester Academy, a private institution, founded in 1874; and several other libraries, societies and educational institutions.

The University is located in the western part of the city about a mile from the central station.

Before the charter was applied for, in January, 1887, about nine acres of land had been bought, and to this single lot other tracts near by have since been added.

Buildings.

A plain, substantial and well-appointed central building, 204 by 114 feet, four stories high, and with superior facilities for heating, lighting and ventilation, has been constructed of brick and granite, and finished throughout in oak.

A chemical laboratory, designed after consulting many experts and plans of recent European buildings, and containing about 50 rooms, is nearly completed.

The foundations of a still larger department building are laid.

Notices.

The work of instruction will begin in the five departments above announced, on Wednesday, Oct. 2, 1889.

The charge for tuition, giving all the privileges of the University, but not covering laboratory fees, will be \$200 per annum.

Board and lodging can be obtained near the University at very moderate rates.

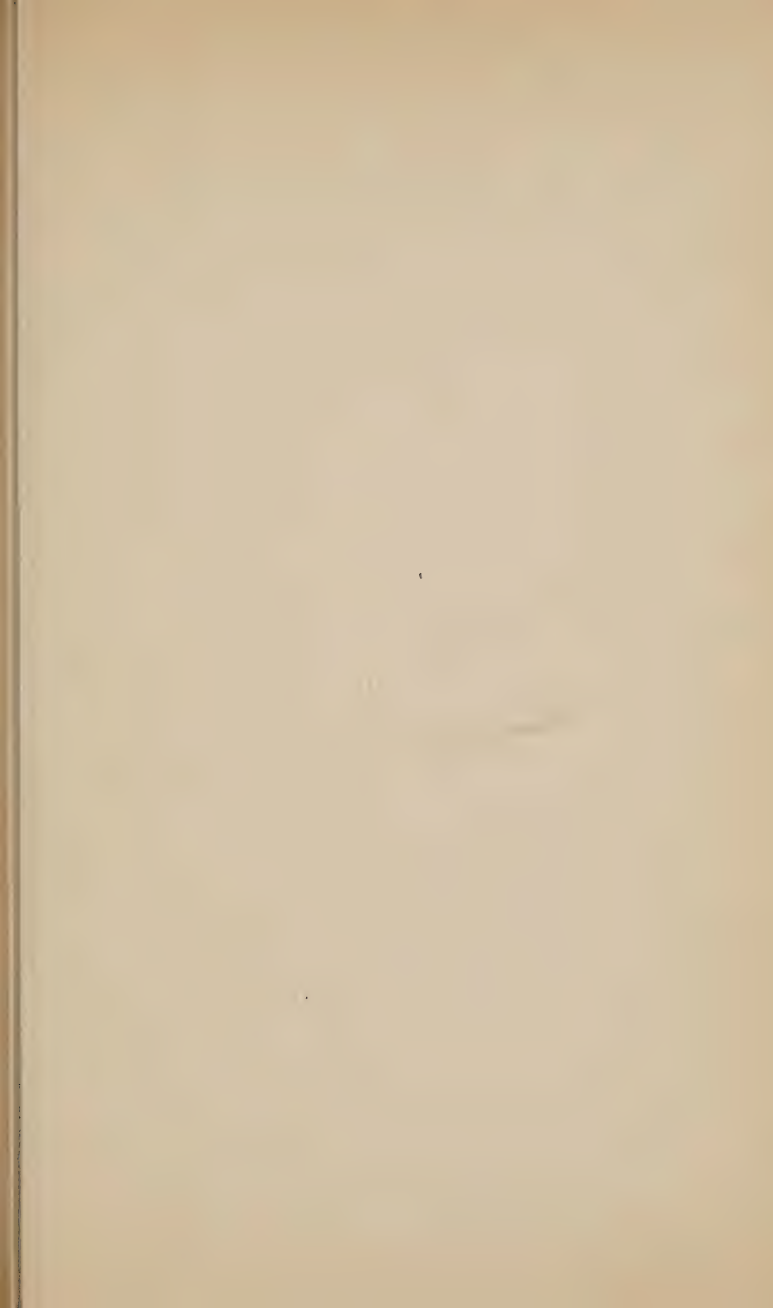
Further announcements concerning instructors courses, matriculation, examinations, fellowships, etc., will be made from time to time during the summer.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk.

G. STANLEY HALL,

President of Clark University.





CLARK UNIVERSITY,

WORCESTER, MASS.

Opening Exercises.

OCT. 2, 1889.

TRUSTEES.

President,	-	-	-	JONAS G. CLARK.
Vice-Presidents,	-			{ CHARLES DEVENS. GEORGE F. HOAR. WILLIAM W. RICE.
Secretary,	-	-	-	FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark.	
Stephen Salisbury.	John D. Washburn.
Charles Devens,	Frank P. Goulding.
George F. Hoar.	George Swan.
William W. Rice.	Edward Cowles, M. D.

COMMITTEES.

FINANCE.

Jonas G. Clark.
Stephen Salisbury.

Stephen Salisbury.

BUILDINGS.

Jonas G. Clark.
John D. Washburn.

BY-LAWS.

Jonas G. Clark.
William W. Rice.
John D. Washburn.
Stephen Salisbury.
George Swan.

James P. Hamilton, - Cashier.

The Dedicatory and Opening Exercises
of

CLARK UNIVERSITY

will be held on

Wednesday, October Second, at Three o'clock in the
afternoon,

in the large hall of the University.

Exercises will be as follows :

Prayer.

Inaugural Address by President G. Stanley Hall.

Address by Senator George F. Hoar.

Other brief Addresses.

Judge Charles Devens, will preside.

The Trustees invite :

The City Officials,

Clergymen of all Denominations,

Members of the Press, Bar, and Medical Profession,

All connected with Educational Institutions,

All Friends of the University.

A general Invitation is given through the public press.

FRANK P. GOULDING,

Secretary of the Trustees.

CLARK UNIVERSITY.

OPENING EXERCISES.

In accordance with a vote of the Trustees, the dedicatory and opening exercises of Clark University were held on Wednesday, October 2d, at three o'clock in the afternoon, in the large hall of the University. The Trustees had invited

THE CITY OFFICIALS,
CLERGYMEN OF ALL DENOMINATIONS,
MEMBERS OF THE PRESS, BAR AND MEDICAL PROFESSIONS,
ALL CONNECTED WITH EDUCATIONAL INSTITUTIONS,
ALL FRIENDS OF THE UNIVERSITY.

An audience of fifteen hundred filled the available standing room and many could not gain entrance to the hall. Seats were provided upon the platform for the trustees and instructors.

GENERAL CHARLES DEVENS presided, and on taking the chair spoke as follows :

Ladies and Gentlemen :

On behalf of the Founder and of the Corporate Board of Trustees into whose hands he has confided

his munificent gift, I cordially welcome all present to the simple ceremony by which we propose to mark the commencement of the work of this university. I especially welcome the Mayor of the city, the principals of its educational and literary institutions and their associates, the clergy and all those whom we have invited to meet us on this interesting occasion. While we have not extended our invitations outside of the limits of the city to many friends of science and education whose appreciation and encouragement we highly value, it is because our present state of preparation, although sufficient to justify us in commencing the work in those departments of science which we have announced for instruction, is less complete than we could desire, although in matters of detail rather than in those of substance. Whether there shall be at some later period a more formal opening or dedication, will be a matter hereafter to be considered.

Two years since, in this month of October, we assembled to lay the corner-stone of the edifice in which we are gathered to-day. While most of us have been permitted again to unite to-day, it is impossible to forget that of the original Board of Trustees then present, one of the number has passed away, and I linger for a moment to recall a gentleman so modest, so learned, so wise, that he inspired alike love and respect among all classes and conditions of men ; a scholar, who in the toils of an arduous profession, never forgot his love of learning, a physician justly reckoned in this Commonwealth among its masters of medical science, and yet, broad and generous as even the boundaries of that science, who never limited his knowledge or his studies to it. I need not in this presence say that

I allude to the late Dr. Joseph Sargent. His loss was a public one, to the community in which he dwelt, to the State of which he was a citizen, to the charitable and educational institutions with which he was connected, in which we as his associates were compelled to bear our share.

The edifice of which we then laid the corner-stone and the laboratory which supplements it are completed and furnished—intended for the purposes of investigation and instruction, its library halls and rooms for recitations will be seen to be commodious and convenient. The solidity and thoroughness which characterizes these external structures will, we hope, in a greater degree mark the education offered and the studies pursued here.

It has been determined after full discussion to commence our courses of instruction in five different departments of science only, instead of at once undertaking all those with which we hope and confidently expect hereafter to deal, and to proceed further only as we shall be satisfied that we have reached, in what we have undertaken, the fullest proficiency.

For these departments an ample corps of professors and instructors (whose competency we cannot doubt) has been provided, whom I cordially welcome on behalf of the Founder and Trustees, and whom I know will also be welcomed by the scholars and educators and by all the citizens of this prosperous and hospitable city. In apportioning their labors we have sought that they should not be so incumbered by the work of the immediate instruction of pupils that they shall in any important degree be deprived of the opportunity of pursuing themselves those scientific investigations

which the whole community may properly look for and expect from a university.

Some time since we invited Prof. G. Stanley Hall, of Johns Hopkins University, to aid us in the organization and preparation of our University and to become its first President. It might be indelicate in his presence to say how warmly our choice has been approved by most eminent scholars and scientists, perhaps even to say how much we feel that we have cause to felicitate ourselves that we have been able to secure his services, but it is not indelicate to assure him, as we reach this important era, on behalf of the Founder and the Trustees, of the respect and esteem in which, after an intercourse of more than a year and a half, we hold him, and of our entire confidence in his judgment and ability.

President Hall will in his address say something of his scheme for the University and the place which he shall desire to have it fill among the educational institutions of the country.

The moment of commencing a great enterprise, if one of hope, is one of anxiety also. Of those to whom much is given much is rightfully required. We have received from the Founder of the University a most generous gift, the good effect of which, if wisely used, will be felt long after the grass grows green above each one of us. It has been supplemented by those provisions made by himself and his estimable and honored wife, which, by means of fellowships, open the gates of the University to those of narrow means. In all that has been done it has been the wish of the Trustees to keep themselves in communication with the best thought, the noblest feeling, the highest aspirations of the age in which we live. Nor can we

speak words to-day more appropriate than those used by the Founder at the laying of the corner stone, worthy as they are, to be renewed again and again at every advancing step of the University,—“We therefore here and now dedicate this university to science, letters, art and human progress; and may the giver of all good crown its efforts and labors with his constant and abundant blessing.”

At the close of his remarks, Judge Devens called upon the REVEREND CALVIN STEBBINS to offer prayer.

MR. JONAS G. CLARK, the Founder of the University, then made the following address:

The occasion which calls us together to-day marks a decided as well as an original step in our undertaking. Scarcely more than thirty months ago we formally entered upon our work by accepting the charter granted by the Legislature of the Commonwealth, and by completing our organization under its several provisions. During this time we have made perhaps as rapid progress as could reasonably have been expected when we take into consideration the greatness of the work and the almost infinite variety of detail involved in its execution.

In the progress of our labors we have met with as few obstacles as could have been anticipated, and we present to-day, as the result of those labors, the main building of the University fully completed and ready for occupancy, and a building for a Labora-

tory far enough advanced to answer all our present requirements. Both buildings are receiving the necessary equipments and furniture to render them available for practical use.

In our announcement of May 23rd, we proposed to open on October 2nd for the commencement of actual work. For this purpose we are now here assembled. When we first entered upon our work it was with a well defined plan and purpose, in which plan and purpose we have steadily persevered, turning neither to the right nor to the left. We have wrought upon no vague conceptions nor suffered ourselves to be borne upon the fluctuating and unstable current of public opinion or public suggestions. We started upon our career with the determinate view of giving to the public all the benefits and advantages of a university, comprehending full well what that implies, and feeling the full force of the general understanding that a university must, to a large degree, be a creation of time and experience. We have, however, boldly assumed as the foundation of our institution the principles, the tests and the responsibilities of universities as they are everywhere recognized—but without making any claim for the prestige or flavor which age imparts to all things. It has therefore been our purpose to lay our foundation broad and strong and deep. In this we must necessarily lack the simple element of years. We have what we believe to be more valuable—the vast storehouse of the knowledge and learning which have been accumulating for the centuries that have gone before us, availing ourselves of the privilege of drawing from this source, open to all alike. We propose to go on to further and higher achievements. We propose to put into the hands of

those who are members of the University, engaged in its several departments, every facility which money can command—to the extent of our ability—in the way of apparatus and appliances that can in any way promote our object in this direction. To our present departments we propose to add others from time to time, as our means shall warrant and the exigencies of the University shall seem to demand, always taking those first whose domain lies nearest to those already established, until the full scope and purpose of the University shall have been accomplished.

These benefits and advantages thus briefly outlined, we propose placing at the service of those who from time to time seek, in good faith and honesty of purpose, to pursue the study of science in its purity ; and to engage in scientific research and investigation—to such they are offered as far as possible free from all trammels and hindrances, without any religious, political or social tests. All that will be required of any applicant will be evidence, disclosed by examinations or otherwise, that his attainments are such as to qualify him for the position which he seeks.

In the government of the University it is our aim and fixed purpose that nothing like favoritism in any form shall be allowed ; that everything approaching religious, political or social bias shall be excluded, and in nothing can the friends of the University more fervently unite than in the prayer that in all times hereafter everything connected with its administration or the ordering of its internal arrangements, and in dispensing its advantages or bestowing its favors—either in the selection of officers or in the admission of applicants for place—shall be kept free from this baleful influence. Experience on every hand teaches

us that the moment these influences gain a hold in the councils of a university the effectiveness of its work will be seriously impaired and its influence for good weakened or altogether gone.

The Board of Trustees extend to the gentlemen who constitute the Faculty, and in whose hands have been committed the educational labors of the University, a sincere welcome to our city. Their presence with us will be an additional attraction to Worcester as a place of residence, and will constitute a new and strong claim for it to be regarded as one of the educational centres of our country.

Personally, I avail myself of this occasion to extend to my associates on the Board of Trustees my sincere and grateful thanks for the earnest co-operation which they have shown in the progress of our initiatory work ; for the zeal they have constantly manifested in the execution of the trust which they have accepted, for the unwearied labor which they have ever given and for their willingness to bestow their best care upon the work which we have had in hand, that it might be crowned with abundant success.

It is fitting, in conclusion, that I should allude to the great loss we have sustained by the death of one of the original members of our Board—a loss that can scarcely be estimated by those unacquainted with the labors, the duties and the responsibilities which fall upon one who occupied his position. Those labors and duties were always discharged by him with the most scrupulous exactness and with a care which could not have been excelled in the management of his private affairs. But it was not alone upon the University that the great loss fell. Distinguished in various walks of life, exceptionally skilled

in the exercise of his chosen profession, he acquired and maintained through life an enviable and commanding position. He was an accomplished scholar, an upright and large-hearted gentleman. We deeply realize our loss, but feel that ours is not comparable to that of his immediate family. They have our warmest sympathies.

It now only remains for me in behalf of the Trustees to announce the University open and to welcome all those who desire to avail themselves of its benefits and advantages. We pray for the future success of the University which we now dedicate to science, letters, art and human progress in their best and highest forms. We invite the Divine aid ; and may the Giver of all good crown its efforts and labors with His constant and abundant blessing.

PRESIDENT G. STANLEY HALL then delivered the following address :

We are here to mark in a simple way, as befits its dignity, a rare event which we hope and pray may prove not only the most important in the history of this favored city, but of forever growing significance for our state and nation, for culture and humanity.

Located with great forethought in a city whose culture ensures that enlightened public sentiment so needful in maintaining the highest possible academic standards, in a city whose wealth and good will, we trust, are as fair a promise as can anywhere be given or asked of that perpetual increase of revenue now required by the rapid progress of science—in a city

central among the best colleges of the East, whose work we wish not only to supplement but to stimulate, whose higher interests we hope to serve, and whose good will and active co-operation we invite ; governed by trustees of eminence in the nation as well as in the state, who ask no sectarian and no political questions of their appointees, whose influence without and whose counsels within are of inestimable and well appreciated value ; consecrating ourselves to the toil of science at an hour so peculiarly critical and so opportune in the university development of the country, I must believe that not only every intelligent inhabitant of Worcester, but every unbiased friend of higher education everywhere, will wish to add to our already unexpectedly large endowment of public and private good will at home and abroad, his and her hearty, ungrudging and reiterated God-speed.

Just because, instead of the easy and wasteful task of repeating what is already well done about us, we strive to take the inevitable next step and to be the first, if we can, upon the higher plane ; because we must study not only to utilize all available experience wherever we can, but to be wisely bold in innovations wherever we must ; because there will be indifference and misconception from friends who do not see all the importance of our work at first ; because there are difficulties inherent in the very nature of that work itself as great as the work is needed, we must go slowly and surely, establishing but few departments at first, and when they are made the best possible, adding new and most related ones as fast as we can find the men and money to support them. We must prolong the formative period of foundation, and must each and every one realize well that we are just entering upon

years of unremitting toil, in which patience and hope will be tempered with trial. But our cause is itself an inspiration, for it is in the current of all good tendencies in higher education, and of the ultimate success of what is this day begun, there is not a shadow of doubt or of fear.

Our history begins more than twenty years ago, in the plans of a reticent and sagacious man, whose leave we cannot here await to speak of, who in affluence maintains the simple and regular mode of life inbred in the plain New England home of his boyhood ;— plans that have steadily grown with his fortune and that have been followed and encouraged with an eager and growing interest, which extended to even minor items by the devoted companion of his life. Besides a large fund already placed to our account, he has given his experience and unremitting daily care, worth to us large sums in economies, and resulting in well appointed buildings, and a solidity of materials and a thoroughness of workmanship which I believe are without a parallel of their cost and kind in the country. Not only in the multifarious work of the university office, its methods of estimates, orders, book-keeping, of individual accountability for all books, apparatus, supplies and furniture, but in the larger questions of university polity without and effective administration within, in the definition of duty for each officer, the strict subordination and the concentration of authority and responsibility sure to appeal to all who have the instinct of discipline, and which are exceptionally needful where the life of science is to be so free, and the policy so independent ; in the express exemption,

too, of all instructors who can sustain the ardor of research from excessive teaching and examination, in the appointment of assistants in a way to keep each member of the staff at his best work, and to avoid the too common and wasteful practice in American universities of letting four thousand dollar men do four hundred dollar work, in the ample equipment of each department, that no force be lost on inferior tools—in all these and many other respects the ideal of our founder has been to make everywhere an independent application of the simplest and severest but also the largest principles of business economy.

As business absorbs more and more of the talent and energy of the world, its considerations more and more prevailing if not subordinating, whether for better or worse, not only the arts, the school, the press, but all departments of church and state, making peace and war, cities or deserts, so science is slowly pervading and profoundly modifying literature, philosophy, education, religion and every domain of culture. Both at their best have dangers and are severe schools of integrity. The directness, simplicity, certainty and absorption in work so characteristic of both are setting new fashions in manners, and even in morals, and bringing man into closer contact with the world as it is. Both are binding the universe together into new unities and imposing a discipline ever severer for body and mind. When their work, purified of deceit and error, is finished, the period of history we now call modern will be rounded to completeness, culture will have abandoned much useless luggage, the chasm between instruction and education will be less disastrous, and all the highest and

most sacred of human ideals will not be lost or dimmed, but will become nearer and more real.

When one who has graduated with highest honors from this rigorous school of business, after spending eight years of travel abroad studying the means by which knowledge and culture, the most precious riches of the race, are increased and transmitted, and finding no reason why our country, which so excels in business, should be content with the second best in science, devotes to its services not only his fortune at the end of his life, but also years yet full of exceptional and unabated energy, we see in such a fact not only the normal, complete, if you please, post-graduate ethical maturity of an individual business life, but also a type and promise of what wealth now seems likely to do for higher education in America. It is no marvel that our foundation has already been so often so conspicuously and so favorably noted in authoritative ways and places in an european land where, if monarchy should yield to a republic, university culture could not penetrate its people as it now does. It is thus a more typical and vital product of the national life at its best than are foundations made by state or church in which to train their servants. In thus giving his fortune to a single highest end as sagaciously and actively as he has acquired it, may our founder find a new completeness of life in age, which Cicero did not know, and taste

——“all the joy that lies
In a full self-sacrifice.”

The very word science, especially when used in its relation to business, is too often degraded by cheap graduates who are just fit to look after established

industrial processes, but are useless if competition finds or needs new and better ones ; who certify to analyses of commercial products that good chemists know are impossible ; who, if international competition in manufactures were more free, would give place to better trained, perhaps German, experts still faster than they are doing ; who, in criminal, medical and patent law suits often have the address to carry judge and jury against far better chemists, but who have no conception of the higher quality and more rigorous methods of their own science ; who make chemistry, physics and geology mercenary, culinary, the servants instead of the masters of industrial progress, and the very "life-springs of all the arts of peace or war." This evil, although so great and common that even the best men in other professions too rarely see the high ideal culture power of real science, is yet only incidental and temporary.

A good illustration of the high and normal technological value of pure science is at hand in dyeing, one of the most scientific among the many and increasing chemical industries. England furnishes nearly all the raw, formerly valueless, material for coal tar colors, out of which Germany made most of the seventeen and a half million dollars' worth manufactured in 1880. England bought back a large fraction of the colored goods, and Germany made the profits, because she could furnish the best training in pure chemistry. It is for this reason that she is driving other countries out of the field in other leading chemical industries. The great factories there employ from two or three to more than a score each of good, and often the best, university trained chemists at large salaries, and the best of these spend a good part of their time in original

research in the factory laboratories. The prospect of these lucrative careers has had very much to do in filling the chemical laboratories of the universities with hundreds of students, and the German government (best that of Prussia) has met the demand by erecting and equipping new and sometimes magnificent laboratories at nearly all of her universities. New artificial processes of making organic products of commerce have freed thousands of acres of land where they were formerly grown, and have made new industries and often impaired old ones. Many professors of chemistry make large outside incomes, nearly all are sanguine; some even declare that before very long leading drugs, and even food, that will equal if not actually excel nature's products, will be made artificially. The leading professor in one of the largest chemical laboratories of Germany told me in substance that he no longer went after outside technical work, but now made it a virtue to wait for it to seek him, and it has been strongly urged that even the government should take steps to prevent the migration of German chemists to the universities of other countries, lest Germany lose her pre-eminence in chemical industries.

This remarkable contact of the marvelous new business life and energy of Germany, particularly of North Germany, (which in both suddenness and vigor equals any of the wonderful developments in this country), with staid and tranquil academic ways, has had some marked reverberations and given new direction and impetus to other studies in some other departments where it is not directly felt. It has led to the erection and equipment by the government of great technological schools, and has shown to business men and employers that no course in the sciences

which underlie technology can be too advanced, prolonged or severe to be practical. Where ought the value and significance of such a training be better appreciated than here in the land of Fulton, Morse, Bell and Edison?

There are, however, eminent chemists in Germany, and many more in surrounding European countries, who deplore what they call the irruption of the technical spirit into the universities. They fear the proximity of the factory and the patent office to the university laboratory has narrowed the field of view and made methods of research relatively less severe, they complain that in their teaching they must hasten over inorganic chemistry, neglecting all the other elements for the carbon compounds, and that there are almost no inorganic chemists in Germany; that in choosing between several substances inviting research, one of which promises great commercial value and the other none, strict scientific impartiality is lost; that in the eagerness for practical results, problems are attempted too complex for the present methods of experimenters who are trying to "eat soup with a fork," as one sadly told me, and that thus while published researches are more numerous they are less thorough and have introduced many formulæ that neither prove nor agree, so that much work now accepted must be done over again and far more thoroughly; that even Liebig set a bad example in this respect, and that many new products, of which university chemists boast, are so inferior to those of nature as to be really adulteration.

What I have tried to illustrate mainly in the field of one science is more or less true under changed ways and degrees in the sphere of others. The sciences are also at the very heart of modern medical studies.

Biology explores the laws of life upon which not only these studies but human health, welfare and modern conceptions of man and his place in nature so fundamentally rest. The law of the specific energy of nerves, *e. g.* which Helmholtz says equals in importance the Newtonian law of gravity, and more than anything else made physiology the science which has had so large a share in raising the medical profession in Germany to a position in the intellectual world such as it never had before, doing for it in some degree what chemistry has done for dyeing, and even instruments like the ophthalmoscope, which almost created a department of medical practice, or the spectroscope, now indispensable in the Bessemer process, sugar refining, in wine and color-dye tests, the detection of photographic sensibilizers, in the custom house and in two important forms of medical diagnosis,—all these, to cut short a long list of both epoch-making laws and important instruments, are the direct products of whole souled devotion to unremunerative scientific research.

It is hard for medical students to realize that they can not understand hygiene, forensic medicine, pharmacology and toxicology without a rigorous drill in chemistry ; that they must know physics to understand the diagnostic and therapeutic use of electricity, ophthalmology, otology, the mechanism of the bones, muscles, circulation, etc. ; that zoology is needed to teach sound philosophic thought, generic facts about the laws of life, health, reproduction and disease. These, and sometimes also sciences like mineralogy, anthropology, and psychology, are required in Europe, with much more rigor than is common with us, of every medical student. Thus doctors, like technologists, cannot know too much pure science. An emi-

nent medical practitioner in Europe compares young physicians who slight the basal sciences of their profession and pass on to the clinical, therapeutic and practical parts, to young men who grow prematurely old and sterile. The phrase of Hippocrates, "God-like is the physician who is also a philosopher," is still more true and good in its larger, more modern and looser translation, viz., exalted is the physician who knows not only the most approved methods of practice, but also the pure sciences which underlie and determine both the dignity and value of his profession.

Medical instruction on the one hand must select as its foundation those sciences and those parts of the sciences most useful in meeting man's great enemy, disease. It needs far more anatomy than physics and little mathematics, astronomy or geology. Technical instruction on the other hand is and must be so organized as to reflect the state of industry. It properly lays more stress upon chemistry with its many applications than upon biology, which has far fewer; more upon electricity than upon molecular physics; and more upon organic than inorganic chemistry. The university, which is entirely distinct from and higher than any form of technical or professional instruction can be, should represent the state of science *per se*. It should be strong in those fields where science is highly developed, and should pay less attention to other departments of knowledge which have not reached the scientific stage. It should be financially and morally able to disregard practical application as well as numbers of students. It should be a laboratory of the highest possible human development in those lines where educational values are the criterion of what is taught or not taught, and the increase of knowledge

and its diffusion among the few fit should be its ideal. As another puts it, "The more and better books, apparatus, collections and teachers, and the fewer but more promising students, the better the work." In Europe, besides its duty to science the university must not fail of its practical duty to furnish to the state good teachers, preachers, doctors, advocates, engineers and technologists of various kinds. Here a university can, if it chooses, do still better and devote itself exclusively to the pure sciences. These once understood, their applications are relatively easy and quickly learned. The university must thus stand above, subordinate and fructify the practical spirit, or the latter will languish for want of science to apply.

The important facts that are both certain and exact, and the completely verified laws, or well ordered, welded cohesion of thought that approach such mental continuity as makes firm, compactly woven intellectual or cerebral tissue, are so precious in our distracted and unsettled age, that it is no marvel that impartial laymen in all walks of life are coming to regard modern science in its pure high form as not only the greatest achievement of the race thus far, but also as carrying in it the greatest, though not yet well developed, culture power of the world, not only for knowledge but also for feeling and conduct. It is of this power that universities are the peculiar organs; to them is now committed the highest interests of man; from them and from science now comes the light and advancement of the world. They became and remained the asylums of free thought and conviction when Rome and all other privileged orders declined, and their germs were brought and piously and early planted on these shores by our fathers. The term is not only

“the noblest in the vocabulary of science,” but universities are the chief nurseries of talent, where is kept alive the holy fervor of investigation that in its passion for truth is fearless of consequences and has never been more truly and loftily ideal than now, when its objects of study are often most crassly material. It is their quality more than anything else that determines not only the status of the medical and all technological professions, but also whether the legal profession is formal, narrow, mercenary and unlearned as it seems now in danger of becoming, in Germany, because even the German universities, despite their great preëminence in all other respects, are by general consent of the most competent Germans themselves relatively weak in those departments which underlie the practice of law or broadly based on history and social or economic science, informed in administrative experience, and culminating in judicial talent and statesmanship. Universities largely determine whether a land is cursed by a factious, superstitious, half-cultured clergy, or blessed by ministers of divine truth, who understand and believe the doctrines they teach ; who attract and enlarge the most learned, and penetrate the life of the poor and ignorant, quickening, comforting and informing in a way worthy the Great Teacher himself ; and making their profession as it should be—the noblest of human callings.

Compared with our material progress, we are not only making no progress, but are falling behind in higher education. It has been estimated that but five per cent. of the practicing physicians of this country have had a liberal education, and that sixty per cent. of our medical schools require practically no preliminary training whatever for admission, while European laws

require a university training for every doctor before he can practice. Again, we apply science with great skill but create or advance it very little indeed. Should the supply of European science, which now so promptly finds its way here and fertilizes and stimulates to more or less hopeful reaction our best scholars, and upon which we live as upon charity, be cut off by some great war or otherwise, the unbalanced and short-sighted utilitarian tendencies now too prevalent here would tend toward the same stagnation and routine which similar tendencies unchecked long ago wrought out in China. We all most heartily believe in and respect technical and applied science and all grades of industrial education, but these are as much out of place in a truly academic university as money-changers were in the temple of the Most High.

But yet the fact that these and other evils and difficulties are now so widely seen and so deeply felt, that endowments for higher education seem now the order of the day, that the largest single endowment in this country has already so effectively begun so many reforms in scarcely more than a decade in Baltimore ; that churchmen, statesmen and business men now need only to see their own interests in a way a little larger and broader, as they are now tending to do, to co-operate more actively than they ever have done in strengthening our best foundations—such considerations sustain the larger and more hopeful view that our country is already beginning to rise above the respectable and complacent mediocrity still its curse in every domain of culture, and will show that democracy can produce—as it must or decline—the very highest type of men as its leaders. The university problem seems to be fairly upon us. We now need men in

our chairs whose minds have got into independent motion ; who are authorities and not echoes ; who have the high moral qualities of plain and simple living and self-sacrificing devotion to truth, and who show to this community and the country the spectacle of men absorbed in and living only for pure science and high scholarship, and are not mere place-holders or sterile routine pedagogues, and all needed material support is sure to come.

A word so characteristic here that it might stand upon our very seal, is concentration. Of this our founder, in declining to scatter his resources among the countless calls from individuals, institutions and causes, from excellent to vicious, and refusing us as yet, in the one work he has set out to accomplish, no needed thing, sets an example. We have selected a small but closely related group of five departments, and shall at first focus all our means and care to make these five the best possible. Neither the historical origin nor the term university have anything to do with completeness of the field of knowledge. The word originally designated simply a corporation with peculiar privileges and peculiarly independent to do what it chose. We choose to assert the same privilege of election for ourselves that other institutions allow their students, and offer the latter in choosing their subjects a larger option between institutions. The continental habit of inter-university migration also on the part of students, if once adopted here, would, no doubt, stimulate institutions no less than it has stimulated competing departments in the same university. Our plan in this respect implies a specialization as imperatively

needed for the advanced students, as it would we admit, be unfortunate for students still in the disciplinary collegiate stage. If our elementary schools are inferior to the best in Europe, and if our fitting schools are behind the French Lycee, the German Gymnasium and the great English schools it is our universities that are comparatively by far the weakest part of our national system. The best of these best know that 50 or 100 instructors cannot do the work of 350; that they cannot hope at present to rival European governments which erect single university buildings, costing nearly four million dollars each, as at Berlin and Vienna, nor equal the clinical opportunities of large European cities with poorer populations and more concentrated hospital systems. Our strongest universities are far too feeble to do justice to all the departments, old and new, which they undertake. Our institutions are also too uniform; the small and weak ones try to copy every new departure of the stronger ones as the latter copy the far stronger institutions in Europe. If the best of them would do work of real university grade, they should specialize among the fields of academic culture, doing well what they do, but not attempting to do everything, the American system might yet come to represent the highest educational needs of the country. In contrast with the present ideal of horizontal expansion and the waste of unnecessary duplication, we believe our departure will be as useful as it is new.

Again, concentration is now the master word of education. In no country has the amount of individual information been so great, the range of intelligence so wide, the number of studies attempted by young men

in colleges and universities so large for the time and labor given to each, the plea for liberal and general, as distinct from special and exclusive studies, been so strong. This is well, for general knowledge is the best soil for any kind of eminence or culture to spring from, and because power, though best applied on a small surface, is best developed over a large one and not in brains educated, as it were, in spots. More than this, our utilitarian ideal of general knowledge is far more akin to that of Hippias, who would make his own clothes and shoes, cook his own food, etc., or to that of Diderot, who would learn all trades, than to the noble Greek ideal of the symmetrical all-sided development of all the powers of body and mind. The more general knowledge the better; but everything must shoot together in the brain. In the figure of Ritcher, the sulphur, saltpeter, and charcoal must find each other or the man makes no powder. The brain must be trained to bring all that is in it to a sharp focus without dispersive fringes. The natural instinct of every ambitious youth is to excel, to do, or make or know something better than any one else, to be an authority, to surpass all others, if only in the most acuminated specialty. Learning thus what true mental freedom is, he is more docile in all other directions.

If it be extravagant to say that no minds are so feeble that they cannot excel, if they concentrate all their energies upon a point sufficiently small, nothing is more true than that the greatest powers fail if too much is attempted. This is not only a wise instinct that makes for economy, but in the parliamentary committee rooms, in corporation meetings, in the court room, in business, in science, in the sick chamber, the modern world in nearly every department is now

really governed by experts—by men who have attained the mastery that comes by concentration. The young man who has had the invaluable training of abandoning himself to a long experimental research upon some very special but happily chosen point was typically illustrated in a man I knew. With the dignity and sense of finality of the American senior year quick within him, his first teacher in Germany told him to study experimentally one of the score of muscles of a frog's leg. He feared loss and limitation in trying to focus all his energies upon so small and insignificant an object. The mild dissipation of too general culture, the love of freedom and frequent change, aided by a taste for breezy philosophic romancing, almost diverted him from the frog's leg. But as he progressed he found that he must know in a more minute and practical way than before—in a way that made previous knowledge seem unreal—certain definite points in electricity, chemistry, mechanics, physiology, etc., and bring them to bear in fruitful relation to each other. As the experiments proceeded through the winter, the history of previous views upon the subject were studied and understood as never before and broader biological relations gradually seen. The summer, and yet another year were passed upon this tiny muscle, for he had seen that its laws and structure are fundamentally the same in frogs and men, that just such contractile tissue has done all the work man has accomplished in the world, that muscles are the only organ of the will. Thus, as the work went on, many of the mysteries of the universe seemed to centre in his theme ; in fact, in the presence and study of this

minute object of nature he had passed from the attitude of Peter Bell, of whom the poet says,

"A cowslip by the river's brim
A yellow cowslip was to him,
And it was nothing more,"

up to the standpoint of the seer who "plucked a flower from the crannied wall," and realized that could he but understand what it was, "———root and all and all in all, he would know what God and man is." Even if my friend had contributed nothing in the shape of discovery to the great temple of science, he had felt the *omne tuit punctum* of nature's organic unity, he had felt the profound and religious conviction that the world is lawful to the core ; he had experienced what a truly liberal education, in the modern as distinct from the mediæval sense, really is. We may term it non-professional specialization.

Perhaps the most thorough and comprehensive government reports ever made in any language are those of the English parliamentary commissioners on endowments. The first of these occupied nearly nineteen years and fills nearly two-score heavy folio volumes. In all, about twenty thousand foundations, new and centuries old, large and small, devoted to a vast variety of uses, good and questionable, were reported. The conclusions drawn from this field of experience, which is far richer and wider in England than elsewhere, was that of all the great popular charities, higher education has proven safest, wisest and best, and that for two chief reasons—first, because the superior integrity and ability of the guardians who consented to administer such funds, the intelligence and grateful appreciation of those aided by them, and

the strong public interest and resulting publicity—all three combined to hold them perpetually truest to the purpose and spirit of the founders ; and secondly, because in improving higher education, all other good causes are most effectively aided. The church can in no other way be more fundamentally served than by providing a still better training for her ministers and missionaries. Charity for hospitals and almshouses is holy, Christ-like work, but to provide a better training for physicians and economists, teaches the world to see and shun the causes of sickness and poverty. Sympathy must always tenderly help the feeblest and even the defective classes, but to help the strongest in the struggle for existence, is to help not them alone, but all others within their influence.

Of all the many ways of supporting the higher education, individual aid to deserving and meritorious students is one of the most approved. In the University of Leipzig, e. g., four hundred and seven distinct funds can aid eight hundred and forty-nine students. Of these funds the oldest was established in 1325, and they are increasing in number, more new ones having been given between 1880 and 1885 than in any entire decade before. In size they range from thirty-five thousand to fifty dollars, in Berlin from one hundred and forty thousand to one of less than forty dollars. In cases where conditions are specified the most frequent limitation is to students from a certain locality and next to those of a certain family. By the older founders students of theology were more often preferred, but the more recent funds are for medicine, law, philology and pure science, and a fund of over two hundred thousand lately given the University of Marburg is for advanced students in those sciences which un-

derlie medicine. These funds are often given, named for, held and sometimes awarded by churches or their pastors, magistrates, heads of fitting schools, boards of education, representatives of prominent families, for students of their name, the donor himself or herself, individual professors, etc., subject of course to satisfying the university examiners. Many are tenable for one, more for three, and some for five and six years. The funds must be invested with pupillary security, and with interest commonly less than four per cent. In Cambridge and Oxford provision is made for nearly 1,000 fellows and eight hundred scholars, not to mention the exhibitions at Oxford. The fellowships are more lucrative and are designed for more advanced men than are provided for in the German universities, the fellows aiding the master in internal administration. In England, besides the religious and other founders, as in Germany, the great historic industrial and mercantile corporations provide many of the fellowships and scholarships, particularly those of the sixteenth and seventeenth centuries, and they are granted by bishops, curates, heads of business corporations, masters of the great schools, heads or fellows of colleges. In France, where these foundations were swept away by the revolution, stipends and bursaries are provided annually by the Government. New appropriations for the most advanced students of all was the secret of the remarkable *Ecole Pratique des Hautes Etudes*, founded in 1868, of which a recent report just printed for the Exposition says, condensing its substance, that its purpose has always been to foster scientific zeal with no shade of temporal interest, that it restored the almost obliterated idea of higher education, gave unity to scientific interests throughout France, and

made her feel the scholarly desiderata of the age, made young professors not only well instructed, but trained in good methods, that although its profound researches are not manifest to the public, has given a more scientific character to all the faculties, and rendered a service to the state out of all proportion to its cost. In France individuals co-operate with the state in this work.

Has there ever been devised a form of memorial to and bearing the names of husbands, wives, children or parents, by which even the smallest funds could be bestowed in a way more lastingly expressive of the individuality, spirit and the special lines of interest of the donor, more worthy the dead and more helpful to the highest ends of life? Since the first endowment of research in the Athenian Porch and Grove, thousands and thousands of donations of this sort have borne tangible witness to the sentiment so often and vividly taught by Plato that in all the world there is no object more worthy of reverence, love and service than eugenic, eupeptic, well-bred, gifted young men, for in them is the hope of the world.

The more advanced our standards are to be, the fewer will be our students, and the more expensive their needed outfit of books and apparatus. If we divide our running expenses only by the number of students our present fellowships and scholarships allow us to receive out of our two hundred and fifty applicants, the amount we spent per student, the first year, will probably be without a parallel. Besides this, for a number of students with important researches on hand we are expending hundreds of dollars each for their individual needs, and should be glad to do so for more as good men. The best students very often graduate

with empty pockets, but with their zeal and power at its best, and when an extra year or two would make a great difference in their entire career. Also, as the field of knowledge grows more complex, the economy of energy needed for concentration is impossible without the leisure secured by comfortable support.

Connected with all the protection, exemptions and privileges so dearly prized and tenaciously clung to by the mediæval universities, there have always been dangers sometimes grave and not yet entirely obviated. The new charity is often popularly called a science as well as a virtue. Its axiom is that no man has a right to give doles to beggars without satisfying himself personally or through some agency to that end that his gift will do good and not harm to the recipient. History, and I may add personal observation, shows that the same general law holds true to some extent in universities. I believe they should not award fellowships to men fresh from college (save in the very rarest cases), unless they are able to guide and direct as well as to follow their work in every detail. A fellow should be encouraged and stimulated by a daily and familiar intercourse with the professors. His methods, reading and researches should be kept at their best and the entire resources of the institution should be a soil for his most rapid and helpful growth. Students thus served, even if their gratitude does not prompt them, as in some late instances in Germany, to study, revive and try to conform with piety to the ideal of ancient and almost forgotten donors, whose provisions they enjoyed, will not be lacking in appreciation. To appoint a man to use such funds in electing among undergraduate courses, or to take his chances among the confusing multifarious subjects offered in

foreign institutions is, I believe, in most cases of small utility, and in some cases that I know, positively harmful. May the methods of exclusion we are studying be so effective that neither our precious funds nor the precious energy of our instructors be wasted upon the idle, stupid or unworthy students, now too often exposed in vain for four years to the contagion of knowledge.

"Education used to be a question for ladies and for schoolmasters," said a French statesman last spring, but it is now not only a question of state on which the support of all great institutions depends, but the great question into which all others issue if profoundly discussed or studied. So greatly do republics need the whole power of education, and so serious is their struggle for existence against ignorance and its attendant evils, that it has well been said that the problem whether this form of government be permanent is at bottom a question of education. But monarchies are no less dependent upon the education of their leaders and servants. In his famous address declaring that if Germany was ever to be free and strong, it must be by becoming the chief educational state of Europe, must realize the platonic republic in which the education of its youth was the highest care of the rulers, Fichte laid down the policy which has been one of the chief causes of the wonderful development of that country. Moreover, evolution, which shows that even life itself is but the education of protoplasm, cells and tissues, that the play-instinct in children and the love of culture in adults, not only measure the superfluous individual energy over and above that required by the processes necessary to life, but are perhaps largely the same, also makes it plain that the hunger for more and larger

education of life is but the struggle of talent to the full maturity and leadership which is its right.

For myself I have no stronger wish or resolve than that in the peculiarly arduous labors I expect, I may never forget that this institution should be a means to these high purposes and not degenerate to an end in itself: and may it be as true of our graduates to remotest time, as it is of us in a unique way and degree to-day, that we could not love Clark University so much, loved we not science and education more.

SENATOR GEORGE F. HOAR then made the following address :

An occasion so interesting as the opening of a university ought not to pass by without some word of public gratitude for the munificence that has founded it, some utterance of gratulation and good cheer for him who takes up the heavy burden of its administration, and some statement of the beliefs, hopes and conditions, under which this community welcomes it, and is willing to adopt it among its governing forces, to hold out a reasonable assurance of its support. When the purpose of Mr. Clark was first announced there were many people who thought it would have been better to enlarge the resources of some existing college. But, as his plans have gradually unfolded, such critics have become satisfied, not only that this university can do its work without jar or friction with any other, but that the time has come when a work should be done in this country which it may not be wholly convenient for any other just now to undertake.

It would be hard to state too strongly the title to public gratitude of a man who, after a life of extraordinary success in great business transactions, devotes the large fruits of that success to the benefit of his fellow men, even if that were all. Such benefactions, though hardly ever on so large a scale, are not unusual in this country. They seem in our day to be the congenial product of the American spirit.

Καὶ οἶδε μὲν προσηκόντως τῇ πόλει τοιοῦτε ἐγένοντο.

But certainly of all gifts for public objects there is none so delightful to contemplate as the foundation of a college. With rare exceptions it is the safest and surest of all endowments. There may have been a few obscure cases where an endowed institution of learning has perished from the loss of its funds. But they are almost unknown. These places become the hallowed spots in the eyes of nations, like the scenes of famous battles, or the places where the foundations of great states have been laid, or where great civic scenes have occurred, or the dwelling places or burial places of heroes or statesmen. Pilgrims from afar visit them. Foreign war spares them. They survive all changes of constitution or dynasty. International law throws its protection about them. In the bloodiest and angriest civil strifes men

“Lift not their spears against the Muses’ bower.”

Their pupils, scattered over the country, retain an attachment for them and for each other, which is to the college like a coat of chain armor, and which is one of the strongest bonds of the national life itself.

It is curious to see the dates of the endowment of the ten great schools of England; Eton, 1440; Winchester, 1380; Westminster, 1560; St. Paul’s,

1500; Merchants Taylors', 1560; Charter House, 1611; Harrow, 1571; Rugby, 1567; Shrewsbury, 1549; Christ's, 1552. At Winchester, William of Wykeham, founded in 1380, a school which still stands, and has remained through six dynasties. Hanover, Stuart, Tudor, York, Lancaster, Plantagenet, have successfully struggled for and occupied the English throne, while in the building which Wykeham in his lifetime planned and built, the scholars of Winchester are still governed by the statutes which he framed. The origin of Oxford and Cambridge, as of many of the universities of the continent, is lost in the darkness of antiquity.

But I find an especial sublimity in the purpose of the founder which gives this institution its distinctive peculiarity, certainly among American institutions of learning. It seems to me very remarkable that a man whose own training and life, whose own disciplines and successes have been among what are called practical affairs, who in early life had so well known the need of the strict economies in which our fathers in New England brought up their children, should have conceived the plan of endowing an institution where the study of science for its own sake, as an end, and not as an instrument, should be the leading object; that he should have called into its service eminent scholars whose chief occupation is to be research rather than teaching; and should have understood so perfectly that while waste and extravagance in the smallest things are not only wrong but criminal, the costliest man or equipment is often the cheapest, so the highest excellence cannot otherwise be attained.

Those of us who have had any part in the organization of this undertaking well know that the man who founded it is still the wisest of its administrators. This

whole people will join with them in the prayer that his life may be long spared to witness the growth of the tree he has planted, and to enjoy the gratitude of the youth whose lives he has blessed. As God denied children to Washington that his country might call him father, so, to our founder shall, through remotest time, uncounted generations educated by his bounty, stand in the place of posterity.

Some questions or doubts have arisen in friendliest quarters whether we may not find elements of weakness in certain portions of our design. It is said that the strength of the American university is its alumni ; that no endowment, however ample in the beginning, will be enough to meet the new demands and great cost of scientific education, or the emulations which must, sooner or later, arise, without large and constant addition from the affection and gratitude of the graduates ; and that, under our system of devotion by specialists to a few special pursuits, neither class feeling, which is born of community of studies, nor warmth of attachment to the university as the alma mater who has opened the eyes of the child to all knowledge and beauty and truth, is likely to grow up.

It is said that our scheme does not include moral or religious nurture, without which the chief end and purpose of all education fail.

It is doubted, also, whether, after all, science has any other proper function than that of the hand maiden of human life ; whether the need of this country be not still so great, both in the development of her vast resources, and in the competition of her industries with those of other countries, of all the aid which science can lend her, that it is almost wasteful to use either the

brains of her students or the resources of her capital, for any other object.

These questions experience alone can finally answer ; but we may perhaps say a word about them without presumption.

There is no doubt that the relation of classmates to each other has been a source of strength to our American colleges. Youths of the same age grow up together and pursue together the same prescribed studies. They look back in after life on the same memories and experience of the golden days of boyhood. But that state of things is already changing. The elective system and the increasing size of the classes have already gone far to do it away. It is now almost unknown in England. We hope to find an ample substitute for it in the close and constant personal relation between instructor and pupil. If we are able to bring here great and shining lights of science, who shall conduct their pupils along the attractive paths of an original research, which they are to share and partake with each other, we have no fear that our youth will fail in gratitude and affection. The heart of no pupil of Agassiz is likely to grow cold toward the spot hallowed by the master's lessons. The thick warbled note of the Attic bird never failed to bring back the olive groves of Academe to the loving memory of the disciple of Plato.

Let no man think that this university is to be indifferent to the moral or religious character of her children. She will signally fail in the judgment of those who expect most from her, if the truths to be revealed to those who study here shall fail to beget a spirit of child-like reverence in the presence of the Author of all truth, or if "by the unlocking of the gates of sense,

and the kindling of a greater natural light, anything of incredulity or intellectual night shall grow up in their minds toward divine mysteries."

We do not exalt science above faith, or intellectual attainment above moral character. The child that has learned to govern its will by the golden rule, though it can scarce count its fingers, is higher in the scale of being than the astronomer who has not learned that lesson, though he know all Kepler's laws and have catalogued the stars. Our pupils will come here, mature in years, with characters largely formed. They will devote themselves to, and be absorbed by, the pursuit of truth. They will have for guides, companions, and masters men who will themselves be an example and an inspiration to all moral excellence. There is little danger that the tares will get into the measures that are already filled with wheat.

Speaking now for myself alone, I have little sympathy with that arrogant and disdainful spirit with which some men who undertake, with little title, to represent science in this country, sneer at any attempt to make use of the forces she reveals to us for the service of mankind. Some one said, the other day, that science was becoming a hod-carrier. I do not see why the term "hod-carrier" should express the relation rather than the term "benefactress." I do not see, either, that there is anything degrading in the thought that the knowledge of the learned man enables him to lift the burden, beneath which humanity is bowed and bent. I do not know that science is exempt from the divine law, "He that is greatest among you, let him be the servant of all." If the great forces of the universe perform all useful offices for man, if the sunshine warm and light our dwellings,

if gravitation move the world and keep it true to its hour, nay, if it keep the temple or cathedral in its place when the hod-carrier has builded it, I do not see why it should not lend its beneficent aid to him also. Our illustrious philosopher advised his countryman to "hitch his wagon to a star." The star will move no less serenely on its sublime pathway when the wagon is hitched to it. I do not know that any archangel or goddess, however resplendent the wings, has yet been constructed or imagined without feet. I do not know that any archangel, however glorious, has ever been created or imagined without sympathy for suffering humanity,

I look for great advantage to the country, both in wealth and power and in the comfort and moral improvement of the people by the application of science to the useful arts.

But all this is very different from the hireling spirit, which loses all interest in the revelations of divine wisdom, but for the riches she displays in her left hand; all this is very different from requiring of the investigator anything but the search for absolute truth. Agassiz, who had no time to make money, and who knew the rich treasures of the Calumet and Hecla mine, without caring to take advantage of them; Henry, who knew the powers of magnetism years before Morse came with his harness for the steed, are still our best examples of the servant and teacher of science.

So may this university of ours, modestly, yet hopefully, take its place in that lofty company. It will be a base thing if we let it fail. Massachusetts in her poverty and weakness created the common school and the college. She will disdain to fall behind other

countries in the higher education which the new centuries require.

General Devens then called upon REV. EDWARD EVERETT HALE for remarks.

DR. HALE, spoke briefly of the honor and privilege it was to speak here. But a short time ago he was present at the quarter millennium anniversary of his college, and he wished he might be present at the similar occasion in the history of this university. But in place of this, people could look back among the files of the papers and find his name with those who spoke at the dedication. He wished he could have foreseen the establishment of such an institution, but he had not, though he could say that America was doing wonderfully well for the Americans. It was in the education of *men* that there was a lack of facilities, especially in the education of those just out of college. The progress of an education should not be broken short when a man has just found out what he wants; when he has discovered what chemistry is, what the study of physics implies, and so on. For this purpose, it was that Clark University has been organized. He said that he had been to many university commencements, but never before had he been present at the commencement of a university. The country does not know yet the meaning of the word university. Some think of the city of Paris as a place where one goes to spend money for the opera, or where, if they were lucky, they might see a revolution. But its great university is the greatest thing in Paris. We go into our so-called universities and find

professors explaining to the boys the difference between the masculine and feminine genders. In the Paris University the professors lecture to their equals ; in America it ought to be the same. He said that he was indebted to the audience for their kindness in listening to him, and it was always a pleasure to talk to a Worcester audience. He felt that America ought to be able to teach Americans everything. It was true though that men like Agassiz were Swiss and had taught Americans, but he hoped that Clark University might turn out many like him, who should give heart and soul to the work of science.

U. S. Minister JOHN D. WASHBURN, spoke as follows :

He thought it was worth while to come four thousand miles to mingle his hopes and aspirations with those of his associates. If it were merely to express his personal sympathy, he would assume that his presence would be an assurance of that, but for the moment he held something more than a personal relation to the occasion. He did not assume to criticise past methods or any of the systems of other institutions of the present day. In this departure removing themselves in the first instance from rivalry with any, conciliating the good will of all, he knew, whatever the doubter or superficial critic may say, he knew and testified before them that they had the sympathy and God-speed of some of the highest institutions of learning in the Old World and many of its noblest apostles in every enlightened country of Europe. He believed that at this stage in the world's

development the plan here adopted was the wisest, perhaps the only one, on which an institution of advanced learning could be framed and placed at once in the position of doing the greatest possible amount of good. The time is approaching in our country when learning will be cherished for its own sake, not merely nor mainly for the purpose of early entrance on the harvest of pecuniary return, but because it is recognized as one of the highest aims and privileges in human life to help knowledge grow to more and more. The hour has come, in the fullness of time, when the practical may, without abandoning its own ground, freely and generously make room for the ideal by its side. Of all the high qualities essential to the administration of an institution, the highest and most important is that of intellectual courage. Faithful to ourselves, and to the noble founder, who this day enters on those higher than earthly rewards, faithful to the trust we have accepted and to the community whose confidence we enjoy, and for whom we hold this great blessing in trust, faithful in all things and fearless as faithful we shall not fail.

The exercises closed with the benediction pronounced by the REV. DR. MERRIMAN.

ACADEMIC APPOINTMENTS.

HALL, G. STANLEY,	94 Woodland Street
MICHAEL, ARTHUR,	34 May Street
MICHELSON, A. A.,	96 Woodland Street
SORY, W. E.,	14 May Street
WHITMAN, C. O.,	936 Main Street
BOLZA, OSKAR,	978 Main Street
DONALDSON, H. H.,	873 Main Street
LOMBARD, W. P.,	17 Hammond Street
MALL, F. P.,	862 Main Street
NEF, JOHN U.,	939 Main Street
SANFORD, E. C.,	21 Oread Place
BOAS, FRANZ,	210 Beacon Street
BRACE, DE WITT B.,	
BURT, B. C.,	80 Woodand Street
COOK, ALFRÉD,	978 Main Street
LOEB, MORRIS,	9 Maywood Street
MACDONALD, ARTHUR,	77 Piedmont Street
McMURRICH, J. P.,	881 Main Street
MUTHMANN, W.,	
TABER, HENRY,	28 Woodland Street
ALBEE, ERNEST,	1 Agawam Street
BENNER, HENRY,	978 Main Street
BROWN, E. N.,	
BUMPUS, H. C.,	862 1-2 Main Street
BURNHAM, W. H.,	

CARDWELL, J. C.,
 CLARK, THOMAS H.,
 CRAVENS, L. P.,
 DURAND, W. F.,
 FULCOMER, DANIEL,
 HARRINGTON, G. D.
 HARRIS, ROLLIN A.,
 HODGE, C. F.,
 MAISCH, H. C. C.,
 MARSH, CHAS. W.,
 MAYER, A. G.,
 MCADIE, ALEXANDER,
 MCCULLOCH, J. F.,
 METZLER, W. H.,
 MILLER, DICKINSON S.,
 NICHOLS, HERBERT,
 ORR, C. A.,
 PAPCKE, V.,
 RIED, CAMILLE,
 STIEGLITZ, JULIUS,
 SWARTZ, CHAS. K.,
 TUCKERMANN, F.,
 WADSWORTH, F. L. O.,
 WARNER, A. J.,
 WATTS, OLIVER P.,
 WILLIAMS, J. F.,
 WILSON, LOUIS N.,
 YOUNG, J. W. A.,

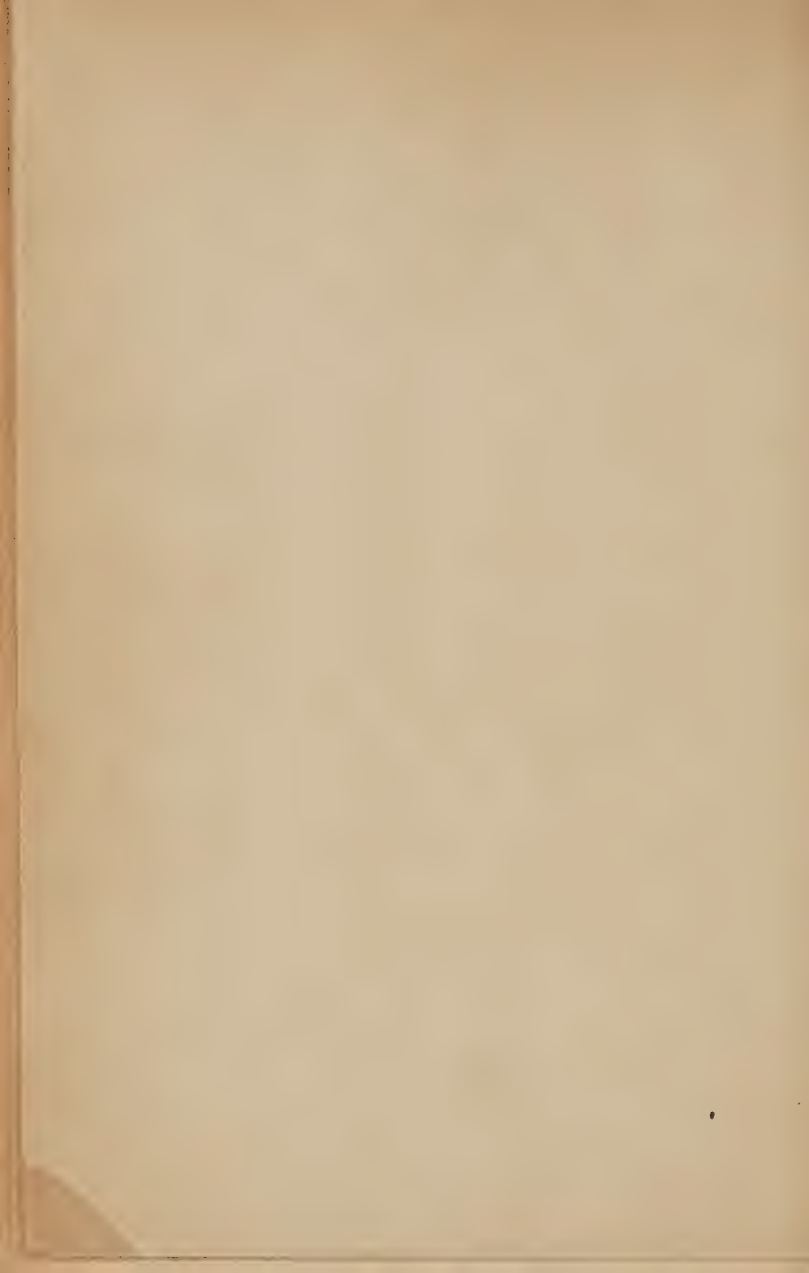
1 Agawam Street
 14 Lancaster Street

 978 Main Street
 84 Woodland Street
 5 Ripley Place
 1018 Main Street
 3 Lowell Street
 14 Crystal Street
 70 Florence Street
 9 Shirley Street
 7 Shirley Street
 8 Gates Street
 428 Park Avenue
 7 Shirley Street
 70 Florence Street

 14 Crystal Street
 84 Woodland Street

 3 Lowell Street
 64 William Street
 6 Castle Street
 6 Hancock Street
 9 Lagrange Street
 70 Florence Street
 11 Shirley Street
 29 Benefit Street





CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Second Official Announcement.

MAY, 1890.

TRUSTEES.

President, - - - JONAS G. CLARK.
Vice-Presidents, - - { CHARLES DEVENS.
 GEORGE F. HOAR.
 WILLIAM W. RICE.
Secretary, - - FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark.
Stephen Salisbury. John D. Washburn.
Charles Devens. Frank P. Goulding.
George F. Hoar. George Swan.
William W. Rice. Edward Cowles.

COMMITTEES.

FINANCE.

Jonas G. Clark
Stephen Salisbury.
John D. Washburn.

BUILDINGS.

Jonas G. Clark.
Stephen Salisbury.

BY-LAWS.

Jonas G. Clark.
William W. Rice.
John D. Washburn.
Stephen Salisbury.
George Swan.

James P. Hamilton, - - - Cashier.

CLARK UNIVERSITY.

REGISTER

AND

Second Official Announcement.

WORCESTER, MASS.:

PUBLISHED FOR THE UNIVERSITY.

May, 1890.

HENRY H. DONALDSON, PH. D., Assistant Professor of Neurology. 873 Main Street.

A. B., Yale, 1879; Sheffield Scientific School, 1880; College of Physicians and Surgeons, New York, 1881; Fellow of Johns Hopkins University, 1883-85; Ph. D., Johns Hopkins University, 1885; Associate in Psychology, Johns Hopkins University, 1887-89.

WARREN P. LOMBARD, M. D., Assistant Professor of Physiology. 17 Hammond Street.

A. B., Harvard, 1878; M. D., Harvard Medical School, 1881; Leipzig, '82-85; Assistant in Physiology, College of Physicians and Surgeons, New York, 1888.

JOHN U. NEF, PH. D., Assistant Professor of Chemistry. 5 Grout Court.

A. B., with honors in Chemistry, Harvard, 1884; Kirkland Fellow Harvard University, 1884-6; Ph. D., München, 1886; Professor of Chemistry and Director of the Chemical Laboratory Purdue University, Lafayette, Ind., 1887-9.

FRANKLIN P. MALL, M. D., Adjunct Professor of Anatomy. 862 Main Street.

M. D., University of Michigan, 1883; University of Heidelberg, 1884; University of Leipzig, 1885-86; Fellow, Instructor, and Associate in Pathology, Johns Hopkins University, 1886-89.

OSKAR BOLZA, PH. D., Associate in Mathematics. 978 Main Street.

Ph. D., Göttingen, 1886; Reader in Mathematics, Johns Hopkins University, 1887-89.

EDMUND C. SANFORD, PH. D., Instructor in Psychology. 21 Oread Place.

A. B., University of California, 1883; Fellow of Johns Hopkins University, 1887; Ph. D., Johns Hopkins University 1888; Instructor in Psychology Johns Hopkins University, 1888.

DOCENTS.

FRANZ BOAS, PH. D., Docent in Anthropology. 210 Beacon Street.

Ph. D., Kiel 1881; Member of Expedition to the arctic regions 1883-4; Docent of University of Berlin, 1885. Anthropological Researches in British Columbia and Alaska, 1886-87; and in the same territory, under the auspices of the British Association for the Advancement of Science, 1888-89.

B. C. BURT, B. A., M. A., Docent in Philosophy. 80 Woodland Street.

A. B., Michigan University, 1875; Professor Indiana State Normal School,

1875-78; and M. A., 1879; Fellow in Philosophy Johns Hopkins University, 1881; and Fellow by courtesy, 1837; Assistant Professor, Michigan University, 1881-87.

ALFRED COOK, PH. D., Docent in Philosophy.

978 Main Street.

A. B., Northwestern University 1877; Ph. D., University of Halle, 1886; Fellow by courtesy in Johns Hopkins University, 1887; Superintendent of Schools, Nimauk, Ill., 1888; Associate in Philosophy, Bryn Mawr College, 1889.

MORRIS LOEB, PH. D., Docent in Physical Chemistry.

9 Maywood Street.

A. B., Harvard, 1883; Ph. D., Berlin, 1887; Assistant to Professor Wolcott Gibbs, 1888-89.

ARTHUR MACDONALD, A. B., A. M., Docent in Ethics.

77 Piedmont Street.

A. B., University of Rochester, 1879; and A. M., 1883; Union Theological Seminary, 1880-83; Harvard University, 1883-85; Fellow of Johns Hopkins University, 1885; Berlin and Leipzig Universities, 1885-86; University of Paris, 1886-87; University of Zurich, 1887-88.

J. PLAYFAIR McMURRICH, M. A., PH. D., Docent in Morphology.

881 Main Street.

A. B. University of Toronto, 1879; and Assistant in Biological Laboratory 1880-81; M. A., 1882; Professor of Biology in the Ontario Agricultural College, Guelph, Canada, 1882-84; Instructor in Osteology Johns Hopkins University, 1884-85; Ph. D., Johns Hopkins University, 1885; Professor of Biology at Haverford College, Pennsylvania, 1886-89; Member of Staff of Instruction Marine Biological Laboratory, Woods Holl, Mass.

F. WILLIAM MUTHMANN, PH. D., Docent in Chemistry.

20 Grand Street.

Assistant in Analytical chemistry, University of Munich, 1884-86; Ph. D., Munich, 1886; Instructor in Chemistry and Crystallography, University of Munich, 1887-89.

HENRY TABER, PH. D., Docent in Mathematics.

28 Woodland Street.

A. B., Yale, (Sheffield Scientific School) 1882; Ph. D., Johns Hopkins University, 1888; and Assistant in Mathematics, Johns Hopkins University, 1888-89.

HONORARY FELLOWS.

CHARLES W. MARSH, PH. D., New York City, Honorary Fellow in Chemistry.

70 Florence Street.

Ph. B., Columbia School of mines, 1879; and Ph. D., 1882; Assistant in Chemistry, John C. Green School of Science, Princeton, N. J., 1882-85; student at Berlin 1885-87; Assistant in Chemistry, Lehigh University, South Bethlehem, Pa., 1887-89.

**J. FRANCIS WILLIAMS, C. E., Ph. D., Salem, N. Y., Honorary
Fellow in Chemistry. 70 Florence Street.**

St. Pauls School, Concord, N. H., 1880; C. E. Rensselaer, Polytechnic Institute 1883, and B. S., 1884; Ph. D., Göttingen, 1886; Student, Berlin, 1887; Director of Technical museum of the Pratt Insitute, Brooklyn, 1887-89.

FELLOWS.

**HERMON C. BUMPUS, Ph. B., Dorchester, Mass., Fellow in Bi-
ology. 862½ Main St.**

Ph. B., Brown University, 1884, and Instructor in Zoology, 1885-6; Professor of Zoology and Geology, Olivet College, Olivet, Mich., 1886-89; Instructor marine Biological Laboratory, Woods Holl, Mass., 1890.

**THOMAS H. CLARK, B. S., Worcester, Mass., Fellow in Chemis-
try. 14 Lancaster St.**

B. S., Polytechnic Institute, Worcester, Mass., 1880; Johns Hopkins University, 1883; Assistant in Chemistry, Wesleyan University, Middletown, Conn., 1886-89.

**ROLLIN A. HARRIS, Ph. D., Jamestown, N. Y., Fellow in
Mathematics. 1018 Main St.**

Ph. B., Cornell University, 1885; Fellow 1886-87 and Ph. D., 1888.

**CLIFTON F. HODGE, Ph. D., Ripon Wis., Fellow in Psychology.
3 Lowell St.**

A. B., Ripon College, 1882; Ph. D., Johns Hopkins University, 1889.

**ALEXANDER McADIE, A. M., New York City., Fellow in Phys-
ics. 7 Shirley St.**

A. B., College of the City of N. Y., 1881, and A. M., 1884; A. M., Harvard University, 1885; Jefferson Physical Laboratory, 1882-5; Physical Laboratory U. S. Signal Service, Washington, 1886-8.

**FREDERICK TUCKERMAN, B. Sc., M. D., Amherst, Mass., Fel-
low in Anatomy. Bay State House.**

B. Sc., Boston University, 1878; M. D., Harvard Medical School, 1882; Fellow of Mass. Med. Soc., 1883; Lecturer in Anatomy and Physiology, Mass. Agri-cultural College, 1883-86.

**HENRY BENNER, M. S., Cressman, Pa., Fellow in Mathematics.
978 Main St.**

B. S., West Chester (Pa.) State Normal School, 1885 and M. S., 1887; M. S., University of Michigan, 1889.

DANIEL FULCOMER, A. M., Hailey, Idaho, Fellow in Psychology. 84 Woodland St.

A. B., Western College, Iowa, 1884, and A. M., 1888.

J. F. McCULLOCH, A. B., A. M., Adrian, Mich., Fellow in Mathematics. 8 Gates St.

A. B., Adrian College 1883; Ph. B. 1884 and A. M. 1889; Assistant Professor of Mathematics Adrian College, 1885-87; Instructor in Mathematics University of Michigan 1887-88; Assistant Professor of Mathematics Adrian College 1888-89.

W. H. METZLER, A. B., Odessa, Ont., Canada, Fellow in Mathematics, 428 Park Ave.

A. B., University of Toronto 1888. Science Master, Collegiate Inst., Ingersoll, Ont., 1889.

DICKINSON S. MILLER, A. B., Philadelphia Pa., Fellow in Psychology. 7 Shirley St.

A. B., University of Pa., 1888.

HERBERT NICHOLS, B. S., Fellow in Psychology. 70 Florence St.

B. S., Worcester Polytechnic Institute, 1871.

CHARLES K. SWARTZ, A. B., Gettysburgh, Pa., Fellow in Chemistry. 3 Lowell St.

A. B., Johns Hopkins University, 1888; Student Berlin and Heidelberg, 1888-89.

F. L. O. WADSWORTH, M. E., B. S., Cleveland, O., Fellow in Physics. 6 Castle St.

E. M., State University, Columbus, O., 1887; M. E. 1888 and B. S., 1889.

J. W. A. YOUNG, A. B., Williamsport, Pa., Fellow in Mathematics. 29 Benefit St.

A. B., Bucknell University, Lewisburg, Pa., 1887; Instructor in Mathematics, Bucknell Academy, 1887-88; Student University of Berlin, 1888-89.

ASSISTANTS.

JOHN C. CARDWELL, M. D., Brooklyn, N. Y., Assistant in Physiology. 1 Agawam St.

M. D., University City of New York, 1888; Assistant in Physiological Department of the Loomis Laboratory, New York City, 1888-89.

A. G. MAYER, M. E., Maplewood, N. J., Assistant in Physics. 9 Shirley St.

M. E., Stevens Institute, Hoboken, N. J., 1889.

V. PÄPCKE, PH. D., Assistant in Chemistry. 14 Crystal St.

Ph. D., Gottingen, 1888.

CAMILLE RIED, Boston, Mass., Instructor in Modern Languages.
84 Woodland St.

SCHOLARS.

ERNEST ALBEE, A. B., Langdon, N. H., Scholar in Psychology. 1 Agawam St.

A. B., University of Vermont 1887.

L. P. CRAVENS, A. M., Carthage, Ills., Scholar in Mathematics

A. B. Carthage College 1878 and A. M., 1879; Principal Mount Morris Academy 1880-84; Professor of Mathematics, Carthage, Ills. 1884-89; Supt. of Public Schools, Carthage, Ills. 1887-89.

W. F. DURAND, Scholar in Physics. 978 Main St.

Agricultural College, Mich.

E. A. KIRKPATRICK, B. Sc., M. Ph., Ames, Iowa, Scholar in Psychology, 84 Woodland St.

B. Sc., Iowa Agricultural College, 1887 and M. Ph., 1889.

C. A. ORR, A. B., Salem, Ohio., Scholar in Psychology.

A. B., University of Michigan, 1887; Johns Hopkins University, 1887-88, Principal High School, Salem, Ohio, 1888-89; Anthropologist Solor Eclipse Expedition, 1889-90.

JULIUS STIEGLITZ, A. M., PH. D., New York City, Scholar in Chemistry. 14 Crystal St.

A. M. and Ph. D., University of Berlin, 1889; Gottingen, 1888.

ARTHUR J. WARNER, A. B., Marietta, Ohio, Scholar in Physics. 6 Hancock St.

A. B., Marietta College 1889.

OLIVER P. WATTS, A. B., Thomaston, Me., Scholar in Chemistry. 9 Lagrange St.

A. B., Bowdoin, 1889.

HONORARY SCHOLARS.

PURSUING SPECIAL INVESTIGATION.

WALTER CHANING, M. D., Brookline, Boston, Mass.

HOMER GAGE, M. D., Worcester, Mass. 50 Pearl St.

WILLIAM S. MILLER, M. D., Worcester, Mass. 3 Castle St.

M. D., Yale Medical School, 1889; Lecturer in Microscopical Technique Mount Holyoke College, 1887-88; Pathologist to the Worcester City Hospital.

TOSHIHIDE SHINODA, Tokio, Japan. 53 Eastern Ave.,

Graduate of the Higher Normal School, Tokio, Japan.

W. G. WATTS, Leicester, Mass. 16 Woodbine St.

Camille Ried.

I went first to school in Freiburg, Baden. I went through a classical Gymnasium. I followed afterwards some University courses, but without matriculation and without aiming at a degree. The reason was that I had been in prospect to leave Germany for France where my father was established, and to pursue a commercial career.

I remained three years in Paris, first occupied with studies especially languages and commercial law (Code de Commerce), and then entered a banking house. In the interest of his bank I went to Spain, where I resided three years. I returned to Paris and remained there three years longer in the same pursuits.

My career in France was broken by the war with Germany, my native country. Threatened with arrest for political opinions I left France, and lost a prosperous position I had gained by merit and with youthful enthusiasm. For some

of a young busy life of nine years came then
to naught.

In America I first established an importing
business which I sold in the year 1881 on account
of my health. I studied then for five consecutive
years continually, especially the history of
Languages, literature, history and philosophy.
After that I began a school of languages and
for preparing young men to College, 1887-90, in
Boston. I remained at Clark University two
years, from 1889-91 teaching Modern languages
French, German, Italian, and Spanish. While
there I followed the lectures on Psychology by
Prof. Donaldson, on Zoology by Prof. Whitman,
on Anthropology by Dr. Boas, and on Criminology
by Dr. McDonald with further home studies.
Since leaving Clark University I have taught
at the Nautical School on board the U. S. S. Enterprise
and been tutoring young men from Harvard.
I have written an immense number of notes.

and has used mostly for teaching purposes and
for my own use, and do not know at yet
whether any will ever be printed or not.

Note: by C. M. 4 Apr. 1960

May 1890 "Register"

As will be seen (p 8, top) Mr Ried was
Instr. in Mod. Lang's - 1889-92 (see p 12 p 74)

~~But - I find no reference to Mod. Lang's
elsewhere in the May 1890 "Register"~~

This statement indicates what instruc-
tion was given in Mod. Lang's by Mr Ried.

see also: p 5, Apr. 1891 "Register"

and * accompanying memorandum in
Mr. Ried's handwriting (this was
found stapled to a letter from Pres.
of U. of Wisc. to Pres. Hall - dated 10 May 93.
Mr. R. had applied for a teaching position
at U. of Wisc. .

* inserted pp 4-5 Apr 1891 "Register"

There is no reference to mod. lang after
1891, until the est. of the college in 1901.

ADMINISTRATION OF THE UNIVERSITY.

The Trustees are the ultimate source of authority in all matters pertaining to the University. They act collectively, through the three committees named below, and also through the President of the University.

BOARD OF TRUSTEES.

JONAS G. CLARK.	
STEPHEN SALISBURY,	JOHN D. WASHBURN,
CHARLES DEVENS,	FRANK P. GOULDING,
GEORGE F. HOAR,	GEORGE SWAN,
WILLIAM W. RICE,	EDWARD COWLES.

OFFICERS.

President, - - - -	JONAS G. CLARK.
Vice-Presidents, - -	{ CHARLES DEVENS,
	{ GEORGE F. HOAR,
	{ WILLIAM W. RICE.
Secretary, - - - -	FRANK P. GOULDING.

COMMITTEES.

FINANCE.	
JONAS G. CLARK,	STEPHEN SALISBURY.
BUILDINGS.	
JONAS G. CLARK,	JOHN D. WASHBURN.
BY-LAWS.	
JONAS G. CLARK,	STEPHEN SALISBURY,
WILLIAM W. RICE,	GEORGE SWAN.
JOHN D. WASHBURN,	

PRESIDENT

(G. Stanley Hall).

The duties of this office were defined by the Trustees, May 23, 1889, as follows :

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University, and attend the meetings of the Board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

These duties were more fully defined by By-Laws enacted by the corporation, September 26, 1889.

FACULTY.

By action of the Trustees the Faculty Staff has been organized as follows :

I. UNIVERSITY SENATE.

Whose duty it is to elect Fellows and to take action upon general requirements for the doctor's degree and other promotions, and to act and advise upon matters officially submitted to them.

II. GENERAL FACULTY.

Whose duty it is to consider all matters not otherwise provided for, and in which all departments of the University are alike interested.

III. THE BIOLOGICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Biology and Psychology.

IV. THE PHYSICAL-MATHEMATICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Physics, Chemistry and Mathematics.

V. THE LIBRARY COMMITTEE.

To be appointed by the president, the duty of which shall be to advise concerning the arrangement, cataloguing and use of books and other matters pertaining to the library not reserved to the Trustees or otherwise provided for.

GENERAL STATEMENTS.

The University now consists of a group of five closely related departments in which all its work and that of the above Instructors, Fellows and Scholars is grouped. These departments are as follows:

- I. Mathematics.
- II. Physics.
- III. Chemistry.
- IV. Biology, including Anatomy and Physiology.
- V. Psychology, including Neurology, Anthropology, Criminology and History of Philosophy.

In addition to these, modern languages are taught in a way to meet the practical needs of students in these departments.

During the year twenty-eight lecturers have given thirty-three courses with an average attendance of eight hearers to each course.

The members of the University now represent graduates of forty-eight colleges or scientific schools.

To express more explicitly the character and policy of the Institution, the Trustees have voted to approve and publish the following statement.

“As the work of the University increases, its settled policy shall be always, to first strengthen departments

already established until they are as thorough, as advanced, as special, and as efficient as possible, before proceeding to the establishment of new ones."

"When this is done and new departments are established, those shall always be chosen first which are scientifically most closely related to departments already established; that the body of sciences here represented may be kept vigorous and compact, and that the strength of the University may always rest, not upon the number of subjects, nor the breadth or length of its curriculum, but upon its thoroughness and its unity."

"This shall in no wise hinder the establishment, by other donors than the founder, of other and more independent departments if approved by the Trustees."

"While ability in teaching shall be held of great importance, the leading consideration in all engagements, reappointments and promotions shall be the quality and quantity of successful investigation."

In focusing its means and care to make each of the above departments the best possible, the University now offers an extension of the elective system to institutions, believing that if this larger option should establish a habit of inter-University migration our higher institutions would be stimulated, and that thus they may be brought to represent the higher educational needs of the country.

ADMISSION.

Only graduate students are admitted, or those of equivalent attainments, unless in rare and special cases.

At present no entrance examinations are required, but, by testimonials, diplomas, personal interviews or written specimens of work, the authorities must be satisfied that the applicant has scholarship enough to work to advantage, and zeal and ability enough to devote himself to his chosen field. The methods of the University are too costly, and its energy and funds too precious to be spent upon men who are not promising and in earnest.

It is highly desirable, and will probably before long be required, that candidates entering any of the five departments should have, besides a knowledge of the other subjects commonly taught in colleges, a reading knowledge of French and German.

For the select students who are received, it is the purpose of the University to open all its privileges, and to supply every incentive possible in the way of books, facilities, and, above all, direct personal stimulus and instruction.

CLASSES OF APPOINTEES.

No clearly marked line exists between students and instructors. Fellows and scholars who have attained some degree of mastery in a special line of work give brief special courses, which are often attended by professors. This is a stimulus to the student, and both tests and exhibits his power in teaching. This, and the custom of instructors to attend each other's lectures, has added interest and efficiency to the work of the University during the year.

1.—DOCENTS.

The highest annual appointment is that of Docent. These positions are primarily honors and are reserved for a few men whose work has already marked a distinct advance beyond the Doctorate and who wish to engage in research. They are not assistants and their relations are directly with the President of the University.

Docents may be provided with individual rooms, and special apparatus may be purchased for their work if desired and approved. They may also be equipped and sent on scientific expeditions. While they will be expected during some part of the year to deliver a limited number of lectures on some special chapter of their department, their time will be mainly reserved for study and research in a way best adapted to qualify them still more fully for academic advancement.

These positions are now official appointments. Appointees or others found worthy however may be formally invested with the *licentia docendi*, the terms of which can now be furnished on application and require a memoir or essay representing original work in their own department, but no examination. This highest formal academic honor will be strictly reserved for those of marked scientific attainment and teaching ability and so far as this diploma can have the significance of a title or degree it will be regarded by the University as a brevet collegiate Professorship.

It is believed that by the existence of such a select body of men of guaranteed scientific training, ability

and approved power to teach, the difficulties under which college trustees sometimes succumb in selecting suitable men for their professors may be diminished, and that otherwise this academic grade will aid in raising standards of academic scholarship in colleges and in encouraging scientific research here.

Good men of this class are desired by the University above all others and may be paid a salary.

II.—CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

The full course provided for candidates for this degree, just from colleges, is three years and for most this period of post-graduate study will probably be necessary. Admission to advanced standing in this course however is possible at the outset or at any time, and those found qualified may be allowed to take the Doctor's examination in two years or even one. Examinations for this degree may be held at any time of the year when in the judgment of the University authorities the candidate is prepared.

For this degree the first requirement is a thesis upon an approved subject to which it must be an original contribution of value. It must be reported upon in writing by the chief Instructor in the department, printed in whole, in part, or in abstract, as the Instructor may determine, at the expense of the candidate and one hundred copies given to the University. An examination and of course a good knowledge of French and German are also indispensable.

For the bestowal of this degree, the approbation of the Board of Trustees must in each case be obtained. They desire that the standard requirements for it be kept the highest practicable, that it be reserved for, men of superior ability and attainment only, and that its value here be never suffered to depreciate.

It is to the needs of these students that the lectures, seminaries, laboratories, collections of books, apparatus, etc., are specially shaped and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the Fellowships and Scholarships are primarily intended, although any of these honors may be awarded to others.

III.—SPECIAL STUDENTS NOT CANDIDATES FOR A DEGREE.

Anyone desiring to undertake a special and approved line of research and whose attainments are such as to satisfy the requirements of the University may also be received. This class includes those who may desire to devote themselves exclusively to one or more of the special branches—mathematics, physics, chemistry, biology or psychology—but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects) may be allowed entire freedom in their choice and combination of studies, and, as special students, may enjoy all the privileges of the University.

These students may, with the approval of the President, be received for less than an entire year.

IV.—MEDICAL STUDENTS.

The University offers special facilities in those fundamental disciplines upon which the study of medicine in all its departments now rests.

Students of sufficient preliminary training can be admitted in the departments of chemistry, biology, anatomy, physiology, neurology and anthropology, and receive here the purely scientific part of a medical education. For such students work in the above departments can be now so arranged as to be almost identical with that of the first two years of the best medical schools of the world. Facilities for clinical instruction and hospital work which commonly constitute the latter part of a medical course, are not yet offered here.

V. PRELIMINARY CANDIDATES.

Non-university students of less special, or less advanced standing than the above four classes, who are nearly, but not quite, qualified to become candidates for the degree of doctor of philosophy, may also be received.

Students of this class must for the present have completed the work of the first three years of a regular under-graduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University of their attainments and that they

contemplate advancing to a degree higher than that of A. B. The privileges and status of these students will be more fully defined later. They may in exceptional cases be elected to Scholarships.

FELLOWSHIPS AND SCHOLARSHIPS.

To no form of educational gift or bequest have probably so many people contributed as to the various forms of individual aid to meritorious students.

Under the names of bursaries, stipends, exhibitions, prizes, benefices, etc., as well as of scholarships and fellowships, the revenues of foundations established by and bearing the names of sometimes hundreds of donors in a single university, are annually distributed.

Sometimes these funds were given by men or women themselves not far removed from need, and are appointed to furnish a student with firewood, a room, a bed, one daily meal, or a coat each year, etc., and sometimes yield one or two thousand dollars to a single holder. Often many students were provided by a single donor, and some of these European foundations, even the smallest, are centuries old, so sacredly are they guarded, and others are even now being established.

The more advanced the education the more such aids are needed, and the more numerous and substantial do they in fact become in Europe.

So great is now the need of bringing the best intellects to fullest maturity, and so increasingly necessary for the highest scientific attainment are now the leisure,

tranquility, books and apparatus thus best supplied, that the demand is strong for still more and greater aids of this kind for advanced and competent students.

Several of the wisest governments in Europe, recognizing that the modern world and its rulers are ruled by experts thus best trained, vie with private munificence in supplying such aids.

THE CLARK FELLOWSHIPS AND SCHOLARSHIPS.

With a deep sense of the peculiar needs of our country in this respect, the founder of this University and his wife in September last provided such opportunity and incentive here as follows :

In addition to all previous gifts of the donor, and apart from the permanent funds of the University, full tuition of two hundred dollars each for thirty meritorious students was paid into the treasury. For eight of these students thus freed from tuition. Mr. Clark also established eight fellowships yielding each holder four hundred dollars per annum, and eight more fellowships yielding each holder two hundred dollars per annum. These, with eight free scholarships as above provided, were known as the JONAS G. CLARK SCHOLARSHIPS and FELLOWSHIPS respectively.

Mrs. Clark established two fellowships yielding four hundred dollars each, and two fellowships yielding two hundred dollars each per annum. These, with the two remaining scholarships were known as the MRS. JONAS G. CLARK FELLOWSHIPS and SCHOLARSHIPS respectively.

These six latter were especially provided for the department of Psychology, while the twenty-four presented by Mr. Clark were to be distributed among the other four departments at the discretion of the president and faculty.

Mr. and Mrs. Clark will contribute twelve thousand dollars for Scholars, Fellows and Docents during the next academic year.

The founder of the University and his wife unite with the trustees and president in inviting sympathy and practical co-operation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

A CITIZEN'S FUND.

In addition to this a citizen of Worcester has given a fund of \$5,000, the income of which is to be used for the aid of "some one or more worthy native born citizens of the city of Worcester who may desire to avail themselves of the advantages of the institution."

THE FIELD FUND.

Mrs. Eliza W. Field has also given \$500, to be called the "John White Field Fund" the income of which is "to provide for the minor needs of a Scholar or Fellow."

PURPOSE AND CONDITIONS OF FELLOWSHIPS.

Fellowships at Clark University are intended for

young men of promise who desire to pursue post-graduate studies in order to fit themselves for intellectual careers. It is desirable, but not required, that candidates for these positions should intend to proceed to the degree of Doctor of Philosophy or to equivalent attainments. In general, those intending to represent some special branch of learning are preferred to those directly fitting themselves for one of the three learned professions although the latter are not excluded.

Applications should state the candidate's course of study and be accompanied by testimonials or diplomas, should indicate a decided preference for some special department and if possible be accompanied by some specimen of his work for the aid of the Board of Selection. Applications will be considered in June and in October and should be in the hands of the president on or before the first of these months. In special cases vacancies may be filled by appointments at any time during the year. The names of unsuccessful candidates will not be made public.

Fellows must reside in Worcester during the academic year and devote themselves to special studies under the direction of their instructors and give such evidence of progress or proficiency before the end of the year as the authorities shall require. They must co-operate in promoting order and the ends of the University, must not teach elsewhere and may be reappointed at the end of the year. Because intended primarily as honors, both Fellowships and Scholarships are awarded without

reference to pecuniary needs, so that those able and desiring to do so may relinquish the emolument and retain the title of "Scholar" or "Fellow."

Both scholarships and fellowships are open only to students in one or more of the five departments announced.

METHODS.

Beside field work, excursions to institutions public and private, coaching and cram-classes, examinations, conferences and other modes by which knowledge now seems best imparted and retained, the following educational methods will be prominent:

LECTURES. The Trustees desire that each instructor of however few students, should prepare and deliver regular lectures, with diagrams, illustrative apparatus and references to standard text books, and the best current literature upon each topic. Advanced students and instructors will also be encouraged to supplement the work of the professors by giving occasional special lectures and courses. Public lectures will from time to time be given.

SEMINARIES. These are stated, perhaps weekly, meetings, often in a department library, for joint, systematic, but conversational work, under the personal direction of the professor, in some special chapter of his subject. Here the results of individual reading are reported for the benefit of all; views are freely criticised; new inquiries, methods, comparisons, standpoints, etc.,

suggested. From the mutual stimulus thus given many important works have proceeded, and the efficiency of universities, especially in Germany where seminaries were first generally introduced, has been greatly increased.

LABORATORY WORK. For beginners this was from the first the best of all forms of apprenticeship, bringing student and professor to a far closer and mutually stimulating relation. Here the manipulation of apparatus is learned, each well-chosen piece of which is an obvious epitome of long lines of research ; processes are criticised, results obtained by other investigators are tested, methods are discussed and perfected. The modern laboratory has thus become an unexcelled school of logical mental discipline, from which is developed, as its best product, that rare independence in research which is the consummation of scientific culture.

LIBRARY FACILITIES.

The University Library, which has already on its shelves over 10,000 bound volumes with large orders still unfilled, has been selected to represent chiefly the five departments. The books are accordingly grouped as follows: Mathematical, Physical, Chemical, Biological, (including Anatomy and Physiology), Psychological, (including Neurology and Anthropology), Reference, General and Miscellaneous.

Full sets of the standard serials and archives in the various Departments have been secured.

All the leading scientific Journals, especially in the five departments, are taken and kept in a large reading room adjoining the main Library room. In all 197 periodicals are now received.

All the privileges of the Library are open to all Appointees of the University alike.

The Library is open from 8 A. M. to 10 P. M. and each member of the University has direct access to every book and journal.

Outside the University are found ;

The Library of the Antiquarian Society, organized in 1812, containing 85,000 volumes, is accessible to all members of the University.

The Worcester Public Library, containing about 250 periodicals and 75,000 volumes, has supplemented the scientific publications purchased by the University and all the privileges are accessible without charge.

A medical Library of 8,000 volumes is also accessible.

By the courtesy of the Librarian of Harvard University and of the Surgeon General at Washington books from both these institutions are sent to the University for a limited time.

By an arrangement with several large book dealers the latest publications from Europe as well as from this country are exposed for inspection or sale upon the Library tables.

NOTICES.

The charge for tuition, giving all the privileges of the

University, but not covering laboratory fees, is \$200 per annum.

Board and lodging can be obtained near the University at very moderate rates.

Further announcements will be made from time to time during the summer.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk,

L. N. WILSON,

WORCESTER,

MASS.

DEPARTMENTS.

The statements of the instructors concerning the courses given during the academic year 1889-90, which follow, are supplemented by announcements of the work to be done during the academic year 1890-91, so far as can be done at the date of issue. These announcements can now be complete only in the case of Professors and Assistant Professors. Further announcements for Docents as well as the work for new Instructors who may be appointed before the beginning of the next academic year will be made later. Only a few standard courses will be repeated in successive years.

I.

MATHEMATICS.

WORK OF THE PAST YEAR.

Instruction has been given in this Department during the current year by

W. E. STORY, PH. D., Professor of Mathematics.

O. BOLZA, PH. D., Associate in Mathematics.

H. TABER, PH. D., Docent in Mathematics.

R. A. HARRIS, PH. D., Fellow in Mathematics.

PROFESSOR STORY

Has directed courses of reading in the following subjects, supplementing the text books by lectures five times weekly :

I.—MODERN HIGHER ALGEBRA; symmetric functions of the roots of an algebraic equation or a system of such equations, differentiants, Sylvester's fundamental theorem, invariants, covariants, ground-forms, the method of generating functions, symbolic methods, eliminants and discriminants.

II.—HIGHER PLANE CURVES; homogeneous point and line co-ordinates, principle of duality, poles and polars, singularities, Pluecker's formulæ, envelopes, reciprocal curves, metrical properties.

III.—GENERAL THEORY OF SURFACES AND TWISTED CURVES; homogeneous coordinates, singularities of surfaces, curvature, singularities and classification of twisted curves, ruled surfaces.

IV.—THEORY OF NUMBERS; divisibility of numbers, primes totients, congruences, Fermat's and Wilson's theorems generalized, solution of linear congruences, primitive roots, quadratic residues theorem of reciprocity.

V.—CALCULUS OF FINITE DIFFERENCES; differences of successive orders, symbolic methods, interpolation, approximate summation, convergency of series, solution of difference equations, functional equations.

VI.—CALCULUS OF PROBABILITIES; fundamental theorems, combinations and permutations, repetitions, mathematical and moral expectation, Bernoulli's theorem, theory of errors of observations, method of least squares.

VII.—QUATERNIONS; vector analysis, ratio of two vectors as an operator, general formulæ, differentiation, linear vector function of a vector, solution of linear equations, applications to geometry and physics.

VIII.—MODERN SYNTHETIC GEOMETRY; principles of projection, idea of measurement unnecessary, projectivity and perspectivity of images, harmonic relation, anharmonic ratio (only incidentally), projective properties of conics (incidentally their metrical properties), extension to three dimensions.

Professor Story has also given a course of lectures on ANALYTIC MECHANICS (including the statics and dynamics of a particle and of a rigid system, and general methods of treating the motion of a system subjected to given restrictions), twice weekly since the middle of February.

DR. BOLZA

Has given the following courses, five times weekly:

I.—DEFINITE INTEGRALS; fundamental properties and methods of computation of simple integrals, Eulerian integrals, double integrals, line-integrals, Fourier's series and integrals.

II.—CALCULUS OF VARIATIONS; absolute maxima and minima of a simple integral containing one unknown function and its first derivative, second variation, variable limits, relative maxima and minima, case of several unknown functions, double integrals, conditions of integrability.

III.—ELLIPTIC FUNCTIONS; elliptic integrals, reduction to normal form, additional-theorem, the three elliptic functions sn , cn , dn , the function $\Theta(u)$, methods of numerical computation, applications.

IV.—THEORY OF FUNCTIONS; conform development, Cauchy's theory of definite integrals between complex limits, Taylor's series.

Dr. Bolza has also given a special course on THEORY OF FUNCTIONS, comprising Weierstrass' theory of elliptic functions and Riemann's theory of hyperelliptic integrals; twice weekly.

DR. TABER.

Has given a course of lectures on the Theory of Matrices, including the substance of Cayley's *Memoir on Matrices*, Sylvester's various papers in the *American Journal of Mathematics*, *Johns Hopkins University Circs.*, *Philosophical Magazine*, Clifford's *Fragment on Matrices*, and Bucheims' extension of Clifford's method. The point of view from which the subject has been treated, has been that of Dr. Taber's paper on the Theory of Matrices shortly to appear in the *American Journal of Mathematics*.

In addition the following topics have been treated : Relation of the Theory of Matrices to Hamilton's Linear Vector Functions, to the Logic of Relatives, and to Linear Associative Algebra and Multiple Algebra in general (Peirce : *American Journal of Mathematics*, vol. iv); Relation of Clifford's System of Geometrical Algebras to the Theory of Matrices; the Theory of Quaternions viewed as the Theory of Matrices of the second order; and the application of the Theory of Matrices to the Linear Automorphic Transformation of a Bipartite Quadric Function.

DR. HARRIS

Has given a short course of Lectures on the APPLICATION OF THE THEORY OF FUNCTIONS TO THE CONSTRUCTION OF MAPS.

WORK OF THE NEXT YEAR.

During the year 1890-91, an INTRODUCTORY COURSE will be given, in two sections:

SECTION A. (PROFESSOR STORY, Three times weekly.)

General Theory of the Higher Plane Curves.

General Theory of Surfaces.

Finite Differences.

Probabilities.

Quaternions.

SECTION B. (DR. BOLZA, Three times weekly).

Definite Integrals.

Differential Equations.

Calculus of Variations.

Elliptic Functions.

General Theory of Functions.

PROFESSOR STORY will also lecture two or three times weekly on

(a) NON-EUCLIDEAN GEOMETRY, during the first half-year;

(b). SPECIAL TOPICS IN ANALYTIC GEOMETRY, during the second half-year;

And will direct work in such other special lines as may be required.

In connection with each of the advanced courses (a) and (b), Professor STORY will conduct a Seminary in which the student will be led to independent investigation of problems which may arise in the course of the lectures.

DR. BOLZA will give the following advanced courses:

1.—THEORY OF FUNCTIONS, including Weierstrass' Theory of Elliptic Functions. (First half-year, two hours weekly).

2.—THEORY OF SUBSTITUTIONS, and its applications to algebraic equations. (Second half-year, two hours weekly).

In connection with these lectures, DR. BOLZA will conduct a Seminary devoted to the analysis of original papers.

FACILITIES.

The facilities to be found here for the study of mathematics in its various branches are unexcelled in this country. The library is provided with complete sets of all the more important current mathematical periodicals and the publications of the scientific societies of the world, with the standard treatises on the subjects now particularly engaging the attention of mathematicians, the collected works of the great mathematicians, and many books

illustrating and discussing the history of mathematics; to which will be added from time to time such other works as may be needed or appear desirable. The department is also equipped with full sets of Brill's admirable models of mathematical surfaces and Björling's thread models of developable surfaces.

Personal guidance will be given each year, as far as possible, to advanced students desirous of pursuing the study of subjects in which courses of instruction are not specially announced.

RESEARCHES OF THE MEMBERS OF THIS DEPARTMENT.

PROFESSOR STORY is the author of the following papers :

On the Algebraic Relations existing between the Polars of a Binary Quantic. Thesis for the degree of Doctor of Philosophy. Leipsic, 1875.

On the Elastic Potential of Crystals. *Am. Jour. of Math.*, Vol. I, pp. 177-183.

Note on Mr. Kempe's Paper on the Geographical Problem of the Four Colours. *Ibid.*, Vol. II, pp. 201-204.

Note on the "15" Puzzle. *Ibid.*, Vol. II, pp. 399-404.

On the Theory of Rational Derivation on a Cubic Curve (followed by a note on Totients). *Ibid.*, Vol. III, pp. 356-387.

On the Non-Euclidean Trigonometry. *Ibid.*, Vol. IV, pp. 332-335.

On the Non-Euclidean Geometry. *Ibid.*, Vol. V, pp. 180-211.

On Non-Euclidean Properties of Conics. *Ibid.*, Vol. V, pp. 358-381.

On the Absolute Classification of Quadratic Loci, and on their Intersections with each other and with Linear Loci. *Ibid.*, Vol. VI, pp. 222-245.

The Addition-Theorem for Elliptic Functions. *Ibid.*, Vol. VII, pp. 364-375).

A New Method in Analytic Geometry. *Ibid.*, Vol. IX, pp. 38-44).

During the current year PROFESSOR STORY has been engaged on a series of investigations in the Non-Euclidean Geometry, the results of which he is embodying in a memoir, probably soon to be ready for the press.

DR. BOLZA is author of the following researches :

Ueber die Reduction Hyperelliptischer Integrale auf Elliptische. *Math. Annalen*, Vol. 28.

Darstellung der Binärform sechster Ordnung durch die Nullwerte der zugehörigen Functionen. *Math. Annalen*, Vol. 30.

On Binary Sextics with Linear Transformations into Themselves. *Amer. Jour. of Math.*, Vol. x.

On the Construction of Intransitive Groups. *American Journal of Math.*, Vol. xi.

DR. TABER

is the author of a paper "On the Theory of Matrices" in which a matrix is regarded as a linear Vector Operator (i. e., as an operator linear and distributive over the units of an algebra) and thus obtained a very simple development of the subject including Sylvester's most important theorems.

He has continued the investigations of this paper and their application to Nonions, and the results are now nearly ready for publication. In addition he has extended some results previously obtained on the development of Clifford's geometrical algebras and their application to non-euclidean geometry.

DR. HARRIS has written:

"The Theory of Images in the Representation of Functions." *Annals of Math.* June 1888.

"Note on the Theory of Images." *Ibid.* August 1888

"On the Expansion of $\sin x$ "; pp. 4. *Annals of Mathematics*. Vol. iv., No. 3.

II.

PHYSICS.

WORK OF THE PAST YEAR.

Instruction has been given in this department during the current year by

A. A. MICHELSON, PH. D., Professor of Physics.

A. MCADIE, M. A., Fellow in Physics.

PROFESSOR MICHELSON

has given the following courses of lectures :

(1) WAVE MOTION, (2) UNDULATORY THEORY OF LIGHT, (3) MINOR COURSE IN ELECTRICITY AND MAGNETISM.

MR. A. MCADIE, who was appointed Fellow in Physics, has also given lectures on Meteorology. A large room (No. 78) has been fitted up as a special laboratory for electrometry for him.

In atmospheric electricity, two principal lines of investigation have been followed—first, the obtaining of a continuous record of the changes in the electrical potential of the atmosphere; and, secondly, the devising and construction of an electrometer that would give this record without the employment of photography. The disadvantages of the photographic method are obvious, but, on the other hand, it has not yet been possible to obtain by mechanical means any record of the needle oscillations. To meet this problem, a Multiple Quadrant Electrometer (a description of which may be found in "Proc. Amer. Acad.," June, 1885), with some important modifications, has been constructed by Brashear of Allegheny. This instrument is of the utmost value in the study of the potential of the atmosphere, for various reasons, chief among which are, that it gives a *complete* record of the movements of the electrometer needle (which is not the case with photogra-

phy); that it allows easy and quick inspection of the record at any time, and the detection of inaccuracies; and that it is more economical in the long run, has a far greater range of sensitiveness, and lacks several of the sources of error constant in electrometers of the ordinary quadrant type. It is the only instrument capable of giving a true record of the potential changes occurring during a thunder-storm.

WORK FOR NEXT YEAR.

PROFESSOR MICHELSON.

During the coming year the theoretical work will consist of a course of lectures for students in Physics, and a minor course for others. The former will be a continuation of the present course of lectures on the Undulatory Theory of Light, and will embrace the usual topics, such as:— Historical Summary of the Undulatory Theory; Theory of Interference Phenomena, and examples of important cases of interference, such as Fresnel's mirrors, refractometers, colors of thin films, diffraction and its application to the theory of the telescope, microscope and spectroscope, the theory of gratings, and of rainbows and coronas.

The subjects of Polarization and Double Refraction will be fully treated from the theoretical standpoint, and also in relation to its applications to photometers, heliometers and polaristobometers.

In addition, Professor Michelson intends to include a detailed account of the results of his own investigations on the velocity of light in air and in liquid media; on the effect of the motion of the medium on the velocity of light, and its bearing on the problem of the motion of the solar system through space; on the application of interference methods to precise measurements, including micrometrical, telescopic and spectroscopic. The course will conclude with an account of the recent progress in the investigation of the relations between light, electricity and magnetism.

The work of experimental research is to be devoted chiefly to the problem of defining the length of the standard meter in terms of a light wave; to ascertaining the relative length of a few light waves with the utmost attainable precision; and to certain inter-

ference phenomena having a direct and important bearing on the kinetic theory of gases.

Besides this, especial attention will be given to the general problem of the practical application of interference methods to measurements of length and angles. As instances of the class of problems falling under this head, in addition to those already referred to may be mentioned the following: replacement of mirrors in galvanometers, electrometers, and all other instruments in which the method of mirror and scale is employed, by refractometers; measurement of co-efficients of elasticity and of expansion; measurement of index of refraction of solids, liquids and gases.

For the first-named work, a very accurate and well constructed instrument (by J. A. Brashear) is to be employed in connection with the large interferential comparer which was originally employed in this work. It is hoped that by this means it will be possible to define the unit of length in terms of the unalterable length of some standard radiation, and to reproduce this standard (or a large multiple of it) with a degree of accuracy exceeding that now attainable, even in copying one standard from another.

MR. MCADIE.

Some experiments will be made during the thunder-storm season, bearing on the question of nervous excitement, depression, hysteria, etc., so prevalent, especially among women, during thunder-storms, and their possible connection with the marked variations in pressure, humidity, temperature and electrical potential of the atmosphere occurring at these times.

FACILITIES.

The following rooms have been assigned for the use of the Physical Department:

On the lower floor, or basement, are three rooms to be used for experiments requiring great steadiness and freedom from vibration. The end-room is designed for magnetic and electrical work. It has been deemed advisable to omit from it the piers and other fittings which it is to have ultimately, so that they may be appro-

priately fixed for special work. At present this room is used by Mr. Wadsworth.

The second room has been provided with solid piers and with a partition which provide steadiness and uniform temperature. The experiments on measurements of wave-lengths, and any similar work, are to be conducted in this room. Between the partition and the windows are two piers for spectroscopic work.

The third room is also designed for delicate experiments requiring stability. It will contain, besides the astronomical clock and Becker balances which it now has, a chronograph and a cathetometer.

The fourth room has been fitted up as a general workshop. It contains lathe, carpenter's bench, etc. This room communicates with a larger room in which the engine, dynamos and other heavy machinery are to be placed, the boiler being in the "general boiler-room."

On the second floor are three rooms, the first of which is the private laboratory and office of Professor Michelson. The next room contains cases for apparatus not in use, as well as tables for work not requiring great steadiness. The third room is used as a lecture-room.

The following may be mentioned as among the more important pieces of apparatus:—

Armington & Sims Engine, 10 H. P., Screw cutting lathe, Edison Dynamo, Becker balance, 1000 gm., dividing engine, cathetometer, Rowland's Spectrometer, with 6 in. concave grating, astronomical clock, chronograph, Ritchie air pump, Ruhmkorff coil, 30 cm. spark, revolving mirror, refractometer (for measuring wave-lengths).

In addition to the facilities briefly mentioned, in the way of apparatus for original investigation, it is proper to mention that the physical library includes most of the modern standard works of reference and physical journals. Among the latter is a complete set of the *Annalen der Chemie und Physik*; of the *Comptes Rendus*; *Proc. Roy. Soc.*, etc.; and *Phil. Mag.*, *Am. Journal*; *Journal de Physique*, and other works.

RESEARCHES OF THE MEMBERS OF THIS DEPARTMENT.

PROFESSOR MICHELSON has published the following papers:—

“Experimental Determination of the Velocity of Light.” I. *Proc. A. A. A. S.*, 1879.

“Experimental Determination of the Velocity of Light.” II. *Proc. A. A. A. S.*, 1880.

“A Method for Determining the Rate of Tuning Forks.” *Am. Journal*, January, 1883.

“Experimental Determination of the Velocity of Light.” III. (*Astr. Papers of the Nautical Almanac*, Vol. II.

“Velocity of Light in Carbon Disulphide and Velocity of Red and Blue Light in same.” *Ibid.*, Vol. 11.

“The Relative Motion of the Earth and the Luminiferous Ether.” *Am. Journal of Science*, August, 1881.

“A New Sensitive Thermometer.” *Journal de Physique*, 1882.

“Interference Phenomena in a New Form of Refractometer.” *Am. Journal*, May, 1882.

“M. Wolf’s Modifications of Foucault’s Apparatus for Measuring the Velocity of Light.” *Nature*, May 7, 1885.

“Influence of Motion of the Medium on the Velocity of Light.” *Am. Jour.*, May, 1886.

“On the Relative Motion of the Earth and the Luminiferous Ether.” *Phil. Mag.*, November, 1887.

“On Method for Making the Wave Length of Sodium Light, the Absolute and Practical Standard of Length.” *Am. Jour.*, December, 1887.

“On the Feasibility of Establishment of a Light Wave as the Ultimate Standard of Length.” *Am. Jour.*, Sept., 1889.

“Measurement by Light Waves.” *Am. Jour.*, Feb., 1890.

“A Simple Interference Experiment.” *Am. Jour.*, March, 1890.

After some necessary delay in the preparation of rooms, piers, machinery, etc., an important investigation into the application of interference methods to astronomical problems has been undertaken, the results of which are soon to be published.

MR. MCADIE is the author of the following researches :

Atmospheric Electricity.—*American Academy of Arts and Sciences*, June, 1885.

Atmospheric Electricity at High Altitudes.—*Am. Acad.*, June, 1885.

The Aurora.—*U. S. Signal Service Note*, No. XVIII.

Electrometer Measurements.—*U. S. Monthly Weather Review*, 1886–7.

Atmospheric Electricity.—*Am. Meteor Journal*, March, 1885, to Jan. 1890.

Memoir of Professor William Ferrel.—Reprinted.

Second prize of \$50 for best essay on “Tornadoes,” offered by *Am. Journal of Meteorology*, 1889, and various smaller papers.

The research for the year has been on ATMOSPHERIC ELECTRICITY, particularly in the following directions:

1. The obtaining of a continuous record by photography, of the variations in the electrical potential of the air.
2. Special studies of these variations at times of thunderstorms.
3. On the oscillatory character of the lightning discharge.

Material for papers on the first two subjects is at hand, and will be utilized.

III.

CHEMISTRY.

WORK OF THE PAST YEAR.

Instruction has been given in this department by

J. U. NEF, PH. D., Assistant Professor of Chemistry.

F. W. MUTHMANN, PH. D., Docent in Chemistry.

M. LOEB, PH. D., Docent in Chemistry.

J. F. WILLIAMS, PH. D., Honorary Fellow in Chemistry.

C. W. MARSH, PH. D., Honorary Fellow in Chemistry.

The department of chemistry has been for most of the current academic year without a head. It is hoped that this position will soon be adequately filled.

DR. NEF.

During the past year Assistant Professor Nef, who, since Dec. 1st has acted as head of the Laboratory, has lectured as follows:

1st. NON-METALS, twice a week until Dec. 1st. This course was then continued by DR. LOEB.

Advanced lectures on Hydrogen, the Halogen and Oxygen groups, and on Nitrogen; their compounds with Hydrogen and the Halogens with special reference to recent work on these subjects.

2d. A course of Lectures on ORGANIC CHEMISTRY from Dec. 1st to the end of the year, two hours per week.

Until March 1st special lectures were given on the fatty compounds, confined to the hydrocarbons, their halogen and nitro derivatives, the alcohols, ethers, amines, ketones, aldehydes, acids and the metallo-organic compounds. Besides discussing the characteristic reactions and relationships of these compounds, most attention was given to recent work on the subject.

Since March 1st lectures on the AROMATIC SERIES have been

taken up. The object here again was to discuss the most recent advances made (four lectures alone being given on the constitution of Benzol), and so to incite the men to original methods of thinking and to become familiar with the chemistry of to-day as presented in the original papers.

DR. MUTHMANN.

DR. MUTHMANN gave a two month's course of lectures in German on ANALYTICAL CHEMISTRY. In this course a general review of the qualitative reactions of the important metals was given, and a more detailed description of the quantitative methods of their determination and separation.

March 1st he commenced a series of lectures, in English, on the rare metals and earths. In these lectures he took up the acid-forming metals and their compounds with other elements. The latter part of the session is devoted to the rare earths and an exact description of the different methods of their separation and quantitative determination.

DR. LOEB.

DR. MORRIS LOEB has given one lecture each week since the 2d of Oct. on PHYSICAL CHEMISTRY, embracing an historical review of stoichiometry; the physical characteristics of gases treated empirically and theoretically, with their application to molecular problems; the relations between the gaseous and liquid states; the behavior of mixtures and the chemical problems involved; the properties of solids; optical phenomena; an glance at the scope of thermo chemistry and electro chemistry.

He has also given a course of lectures on NON-METALS and INORGANIC ACIDS. These lectures were a continuation of Dr. Nef's course and were given twice a week from Dec. 1st to March 1st.

In these lectures the negative elements of the V, VI and VII natural groups were discussed with regard to their analogous compounds and their distinguishing reactions; the oxides were then taken up separately, and acids, finally, were treated more from a theoretical than a descriptive standpoint, especial regard being paid to the typical stages of hydration, oxidation and substitution.

DR. WILLIAMS.

Dr. J. FRANCIS WILLIAMS was granted leave of absence early in Oct. 1889, for the purpose of working up the crystalline rocks of Arkansas, for the state geological survey. The field-work lasted until the beginning of the present year, and since that time the petrographical and chemical investigation of the material collected on the Arkansas trip has been in progress.

Among the facts which have already been brought out by this work, may be mentioned the occurrence of eudialyte and eucolite in the elaeolite syenite of Magnet Cove, and of leucite in much of the rock from the same locality, and the identification of several minerals, such as fluorite, apatite, etc., which have up to this time been, either undetermined or mistaken for some other species.

Lectures on crystallography, with practice in determination of forms, have been given once a week since January first and will be continued until June.

The appliances for work in crystallography, outside of the chemical equipment, consist of a reflecting goniometer, from R. Fuess, Berlin, a horizontal axial angle instrument, a Voigt and Hochgesang polarization microscope for petrographical work on thin sections, and a polariscope for the examination of thick sections. Of these, the first two are placed in a well appointed dark room, while the latter are used in a room which has been specially fitted with such appliances as are required for work with them. A cutting and polishing machine, for use in making thin sections of rock and minerals, completes the list of apparatus at present here; but there has been ordered from Germany, a set of instruments, very similar to those enumerated above, which will be the property of the University, while those described here are all the personal property of Dr. Williams.

DR. MARSH.

DR. CHARLES W. MARSH has given a course of ten lectures on METHODS OF ORGANIC ANALYSIS.

LABORATORY WORK.

The laboratory instruction this year has been under the super-

vision of Drs. NEF and MUTHMANN, the former paying special attention to students at work on organic preparations or prosecuting research work in organic chemistry, the latter devoting himself to those engaged in qualitative and quantitative analysis and those prosecuting research work in inorganic chemistry.

In the organic preparation work, Emil Fischer's book is followed, and the men are strongly advised to devote all the time possible to reading the original papers in connection with their work.

In quantitative and qualitative analysis the pamphlets of Volhard and Zimmermann are used.

WORK OF NEXT YEAR.

DR. NEF.

During the coming year DR. NEF will offer the following courses :

A course of lectures similar in scope and object to those given this year, but more advanced. To understand these lectures a good knowledge of organic chemistry is necessary.

Lectures on the POLYATOMIC FATTY COMPOUNDS, with special attention to the urea and sugar group. On the more complicated aromatic compounds, with special reference to quinoline and pyridin derivatives. Lectures two hours a week throughout the year.

The chief object in these lectures will be to discuss recent work in these lines, and the student will be expected to spend much time in reading the original papers.

DR. MUTHMANN.

During the coming year DR. MUTHMANN will give two courses of lectures. The FIRST will be on the SPECIAL CHEMISTRY OF MINERALS, in which he will treat of the relations, chemical and crystallographical, which exist between inorganic bodies occurring in nature. He will refer especially to the chemistry of Silicates, according to the system developed by Groth. The lectures in this course will be given twice a week for the first half of the year.

The SECOND course will be on SPECTRUM ANALYSIS. In these lectures he will discuss the optical theory of the subject, and give

a brief description of qualitative spectrum analysis. An exact description of quantitative spectrum analysis, with practical exercises in photometric spectral methods, will end the course. Lectures in this course are given twice a week during the second part of the year. Four hours a week will be devoted to the practical exercises under Dr. Muthmann's direction on this subject during the latter half of the term.

ROOMS AND FACILITIES.

A large Chemical Building, described elsewhere, has been completed and about half of the rooms already equipped for scientific work.

On the second floor of the chemical building is a large research room, and adjacent to it a store room, balance room, and combustion room, and lecture room. On the first floor is a steam room and air furnace room.

The large research room has ten working tables, each 12 feet long, and provided with gas and water and a trough in the middle—making it possible to carry on filtration, distillation in vacuum, and most chemical operations even on a large scale. There are sinks at each end of the tables, and for each table a separate large glass hood (2 x 5 ft.) with a height of 5 feet, making ten hoods in all.

On the third floor is the library, a large room equipped with all the periodicals, past and current, necessary for research work.

DR. NEF has a large room fitted up for his organic research work. It contains a desk equipped with gas and water and a lead trough just as the research room desks; also a large glass hood nine feet long, a sink, and a foot bellows and blast lamp.

DR. MUTHMANN has three rooms at his disposition.

1. A room for microscopic and spectroscopic work, equipped with an analytical balance, a Fuess' microscope and polarization apparatus; a Krüss' spectral apparatus for qualitative and quantitative analysis, as well as for spark-spectra.

2. A dark room, equipped with a Fuess' goniometer, No. 2, with arrangements for monochromatic light and for measuring optical axes and refractive indices of crystals.

3. A small place in the cellar is fitted up for nursing crystals at low and constant temperature.

While instruction and direction in laboratory work is first in importance, the student will be expected to acquire a thorough knowledge of recent work in many lines of both inorganic and organic chemistry. It is only by this method that he will be able to concentrate his energies and do good independent work in a single direction, which it is especially desired to encourage here.

Just as a good training in organic preparation work is now considered an essential preliminary to successful research work in organic chemistry, so it is desirable that men should have preliminary training in working with the rarer inorganic elements before commencing research work in inorganic chemistry.

Every incitement and encouragement is given to mature men who have already taken the degree of Ph. D. to come here and pursue a special line of work with a view to presenting themselves eventually as candidates for docentship, which confers upon them the privilege of giving lectures and instruction as in the German Universities.

INVESTIGATIONS BY MEMBERS OF THIS DEPARTMENT.

DR. NEF has published the following papers:

The Volumetric Determination of Combined Nitrous Acid. Amer. Chem. Jour., Vol. v, p. 388. [With Dr. Kinnicutt].

Ueber einige Derivate des Durols. Ber. d. deutsch. chem. Gesell, 1885, 2801.

Ueber Benzochininon-carbonsäuren. Ber. d. deutsch. chem. Gesell, 1885, 3498.

Ueber Benzoehininon-carbonsäuren. } Liebigs Annalen, 237, 1.
Journal Lond. Chem Soc., 1888, 428.

Ueber das Py-3 Phenylchinaldinsäure und das Py-3 Phenylchinolin. Ber. der deutschen Chem. Gesell, 1886, 2427. [Mit Dr. Koenigs.]

Ueber das Py-3 Phenylchinolin und Py-3 B Dichinolyle. Ber. der deutsch. Chem. Gesell, 1887, 622. [Mit Dr. Koenigs.]

Nitranilsäure aus Chloranil. Ber. der deutsch. Chem. Gesell. 1887, p. 2027.

On Tautomeric Compounds. Am. Chem. Jour. xi, 1.

The Constitution of the Anilic Acids. Am. Chem. Jour. xi, 17.

Three lines of work have been under way during the past year. In two of these, sufficient progress has been made, so that the results have been sent off for publication.

DR. MUTHMANN has published the following:

- Über niedere Oxyde des Molybdäns. Inaugural Dissertation, München, 1887.
 Liebigs Annalen, 238, 108.
 Über Polymorphie und Mischkryalle einiger organischer Substanzen.
 Zeitschr. f. Krystallogr., 15, 16.
 Krystallographisch-chemische Notizen. Ibid., 15, 387.
 Krystallographische Untersuchung der Phtalsäure, und einigen Derivate der
 Selben. Ibid., 17, 73. [With W. Ramsay].
 Messelit, ein neues Mineral. Ibid., 17, 93.
 Untersuchungen über den Schwefel und das Selen. Ibid., 17, 336.
 Zur Frage der Silberoxydulverbindungen. Ber. d. Deutch. Chem. Gessellsch.,
 20, 983.
 Krystallographische Untersuchung einiger Derivate der Terephtalsäure.
 Zeitschr. f. Krystallogr., 17, 460.

This last is an investigation conducted during this year at the University.

DR. LOEB is the author of the following:

- Ueber die Einwirkung von Phosgen auf Aethenyldiphe Nfyldiamin. Berichte
 d. deutsch. chem. Gesellschaft XVIII, 2427.
 Ueber Amidinderivate. Ibid. XIX, 2340.
 Das Phosgen und seine Abkömmlinge. Dissertation Berlin, March 15, 1887,
 pp. 51.
 The Molecular Weight of Iodine in its Solutions—Journal Chemical Society,
 LIII, p. 805. Also Zeitschrift für Physikalische Chemie II, 606.
 The use of Aniline for absorbing Cyanogen in gas analysis—Journal Chemical
 Society, LIII, p. 812.
 The rates of transference and the conducting power of certain silver salts.—
 With W. Nernst in American Chemical Journal. Vol. XI, p. 106. Also Zeitschrift
 f. Phys. Chemie. II, p. 948.

DR. WILLIAMS has published the following papers:

- Tests of Rutland and Washington County States.—Van Nostrand's Eng. Mag.
 No. CLXXXVIII, 1884.
 Ueber den Monte Amiata in Toscana und seine Gesteine.—Stuttgart, 1887.

DR. MARSH has published the following:

- "Note on the Ammonia Process for Water Analysis." Am. Chem. Jour. Vol
 IV, No. 3.
 "A method for the Detection of Chlorine, Bromine, Iodine, and Sulphur in
 Organic Compounds." Am. Chem. Jour. Vol. XI, No. 4.
 "A New Form of Adapter," Am. Jour. of Analytical Chem., Jan. 1889.
 "The Reduction of Barium Sulphate to Barium Sulphide on Ignition with Fil-
 ter Paper." The Jour. of Analytical Chem., April, 1889.

DR. STEIGLITZ has published a dissertation entitled:

- "Ueber das Verhalten der Amidoxime gegen Diazobenzol Verbindungen."
 Berichte d. deutsch. chem. Gesellschaft.

IV.

BIOLOGY.

WORK DURING THE PAST YEAR.

Instruction has been given in this department as follows:

ANIMAL MORPHOLOGY.

C. O. WHITMAN, PH. D., Professor of Animal Morphology.

J. P. McMURRICK, PH. D., Docent in Animal Morphology.

H. C. BUMPUS, M. A., Fellow in Animal Morphology.

VERTEBRATE ANATOMY.

F. P. MALL, PH. D., Adjunct Professor of Anatomy.

F. TUCKERMAN, M. D., Fellow in Anatomy.

PHYSIOLOGY.

W. P. LOMBARD, M. D., Assistant Professor of Physiology.

A.—ANIMAL MORPHOLOGY.

PROFESSOR WHITMAN.

PROFESSOR WHITMAN has given a course of historical lectures, covering a portion of the ground outlined in the first two courses announced for the next session. These lectures were intended to set forth the more important part of biological philosophy and discovery from the time of Aristotle up to the present. As no adequate treatise on the subject, from the standpoint here taken, has hitherto been produced, it became necessary to enter upon a long and laborious examination of the original works. The aim has been to work out the subject, not after the manner of descriptive history and biography, but from the standpoint of connected development—to trace the march of discovery, the gen-

esis of ideas, the progress of thought, and the origin, foundation, and relations of doctrines, systems, and schools. The task is important as it is arduous, and a number of years of solid work will be required to complete it. The entire time thus far, except what has been absorbed in editorial duties, and in the supervision of laboratory work and equipment, has been devoted to this task.

DR. McMURRICH.

DR. McMURRICH has delivered a course of lectures on the Morphology of the Cœlenterata, giving a detailed account of the morphology, histology and embryology of the Porifera and Cnidaria, discussing the general questions arising in connection therewith, such as the origin of the nervous system, the origin of alternation of generations in the Hydromedusæ, the origin and affinities of the Siphonophores, and the phylogeny of the various groups, concluding with a discussion of the Gastræa theory.

He has also made a thorough study of the structure of *Cerianthus Americanus*, the results of which are now ready for publication. An investigation of the embryology of the Actiniæ has also engaged his attention, as well as the study of a collection of Actiniæ obtained by the U. S. Fish Commission Steamer "Albatross," on her voyage to San Francisco during the winter of 1887-1888.

MR. BUMPUS.

MR. BUMPUS has lectured on "Affinities of the Crustacea."

B.—ANATOMY.

DR. MALL.

Dr. Mall has lectured throughout the year upon the histology of the tissues arising from the mesoderm.

DR. TUCKERMAN.

Dr. Tuckerman has delivered a brief course of lectures upon the Histology of the Gustatory Organs of Mammals.

DR. GAGE.

Dr. Gage has investigated some special properties of the intestines.

DR. MILLER.

Dr. William S. Miller has been at work during the present year upon *The Anatomy of the Lungs of Mammalia*.

C.—PHYSIOLOGY.

DR. LOMBARD.

Dr. Lombard has lectured throughout the year upon nerve and muscle physiology, treating the following topics:

Properties of nerve and muscle.—Structure with reference to function.—Form of the muscle curve under various conditions.—Influences affecting the irritability of nerves and muscles.—Latent period of nerves and muscles.—Electrical condition during rest and action.—Electrotomes.—Effect of different forms of stimuli, variously applied.—Influences determining the work of muscles.—Chemistry of muscles.—Source of muscular energy.—Heat developed in muscles.—Effect of external influences on muscular action.—Fatigue.—Functions of cerebro-spinal, splanenic and sympathetic systems.—Ganglia.—The white and grey matter of the spinal cord.—Reflex action, etc., etc.

As the lectures were attended by men who were already familiar with the subject, and who were engaged in research in closely allied departments, the lecturer sought not only to recall to their minds what is known, but to teach how these facts were discovered. The lectures were, therefore, freely illustrated by experiments, and much time was given to description of apparatus and methods, in the hope that those engaged in research would have their attention called to new ways of attacking the problems upon which they were engaged.

DR. CARDWELL.

Dr. Cardwell has acted in the Physiological Laboratory as assistant to Dr. Lombard in the preparation of his lecture experiments and in his research work.

Dr. C. F. Hodge, Mr. Nichols and Mr. Fulcomer, from the Psychological department have availed themselves of the privileges of the laboratory for the prosecution of portions of the researches upon which they were engaged.

WORK FOR NEXT YEAR.

A.—ANIMAL MORPHOLOGY.

PROFESSOR WHITMAN.

Professor Whitman will offer next year three courses of lectures, two historical and one embryological.

1. The first historical course will deal with the *Development of Comparative Anatomy*, beginning with Marco Aurelio Severino, and ending with the discussions of 1830 between Etienne Geoffroy Saint Hilaire and Georges Cuvier. The leading aim in this course will be to show how Comparative Anatomy, starting as the hand-maid of Physiology, gradually outgrew its ancillary condition, and became an independent branch of Zoölogy, with aims, conceptions, principles, and methods distinctly its own. Attention will be directed particularly to the origin and development of historic ideas, tendencies, methods and schools, as presented in the early iatric and physiological stages of Zoötomy; in the schools of Haller, Geoffroy, and Cuvier; in the "Anatomie Philosophique" of the French, and the "Naturphilosophie" of the Germans; in the doctrines of the "Scale of Nature," "Unity of Composition," and of Types; in the hypotheses of Evolution and Epigenesis, in Homology and Teleology, etc. The biographical side of the subject will also receive due consideration, especially in the case of such representative men as Malpighi, Swammerdam, and Leeuwenhoek of the 17th century, and Haller, Buffon, Daubenton, Linné, John Hunter, Camper, Vicq d'Azyr, Kielmeyer, Geoffroy, and Cuvier of the later period.

2. The second historical course will be devoted to a critical survey of the subject of *Generation*, embracing an analytic and comparative study of those systems which have marked the high-water level of biological thought at successive epochs from the time of Aristotle to the present.

Following the order of logical dependence rather than of chronological sequence, attention will be concentrated upon those ideas and systems, which have had the most influence in determining the general course of speculation and discovery, and which, therefore, have not only an historical, but also a present, living interest.

The doctrine of Evolution, as it stood in the minds of its originators, Malpighi, Swammerdam, and Leeuwenhoek, as advocated by Leibnitz and Malebranche, and as elaborated and defended by Bonnet and Haller, will be examined at some length, on account of its peculiar historical interest, and especially because modern Evolution has been identified with the old Evolution as finally defined by Bonnet. The identification may be, in fact is, erroneous, but the search for points of contact and of difference is not the less instructive.

The theory of Epigenesis, as developed by Aristotle, Harvey, John Hunter, and Wolff, and as confirmed and extended by von Baer and other embryologists in the earlier part of this century, will be considered *in extenso*; and its relations, both to the old and the new evolution, will be fully discussed.

The consideration of these subjects will involve theories of sex, fecundation, etc., and so will lead up to a review of modern theories of heredity, and the questions raised between the followers of Lamarck, Darwin, and Weismann.

3. The third course, devoted to *Comparative Embryology*, will extend through two or three years. The early part of the course will include, among others, the following topics:

The genesis of the ovum and of its envelopes, the constitution and structure of the ovum, spermatogenesis; maturation of ova and spermatozoa; the phenomena of fecundation, normal and pathological; theories of individuality and of heredity founded on these phenomena; origin and significance of fecundation; cytokinesis, caryokinesis and cytological terminology; the cleavage of the ovum; the different types of cleavage compared; experimental researches in cleavage; pregastrular stages of development; the gastrula, its different types and their derivation; formation of the embryo in vertebrates and invertebrates; double and multiple monsters; germ layers; the trochosphere, a comparison of larval

and foetal types of development; budding and fission; metameric segmentation.

Laboratory work and lectures will be supplemented by personal instruction, conferences, etc.

The organization of this department will be carried forward as rapidly as practicable.

The highest state of efficiency and usefulness open to this department implies the power to avail itself of many natural advantages of a comparatively new world to the morphologist. Material long coveted by European naturalists lies within the reach of means that may be as easily supplied here as they have been in Europe for similar purposes.

Opportunities for study at a marine laboratory will be given to those connected with this department.

The publication of memoirs will be provided for in the JOURNAL OF MORPHOLOGY, which is under the editorial direction of Dr. Whitman.

An artist will be permanently connected with the laboratory.

It is hoped that by the opening of the next session, a BIOLOGICAL CLUB can be organized for the promotion of that important order of scientific activity which is dependent upon the coöperative action of a number of specialists. The work of the Club, as now anticipated, will consist in the presentation of carefully prepared papers and lectures, on topics of both special and general interest, to be followed by general discussion.

The efficiency of such an organization, *caeteris paribus*, is measured by its *numerical* strength. It is on that ground alone that the project deserves special mention. The restriction of the work of the department to pure research removes a long-standing obstacle to the attainment of the end in view, and makes it possible to proceed on a strictly scientific basis. No attempt will be made to cover any branch of morphology which has not its special representative either in the academic staff, or among the Docents, Fellows, or Students of the department. Obviously an organization of the kind here contemplated cannot be a thing of spontaneous and sudden birth. But there can be no question that, from the

outset, very great advantages will flow from it. Through such an association, it becomes possible for investigators, while concentrating attention on a special line of work, to keep informed of the progress of discovery and thought in other branches of research. It is under such conditions that individual effort is stimulated, supplemented, and completed, and at the same time turned to the common advantage of all. Each works for himself, but all share the results. Therein lies the remedy for any dangers that may lurk in specialization.

DR. MC. MURRICH will offer during the session of 1890-91 a course of lectures in continuation of those delivered during the past year, reviewing the Morphology of the Ctenophora and of the Platyhelminths, and discussing the important morphological problems which arise in connection with a study of those groups.

B.—VERTEBRATE ANATOMY.

During the coming year Dr. Mall will give a course of lectures on the development, histology, and comparative anatomy of the organs arising from the endoderm.

Opportunities will be offered to advanced students desiring to investigate special subjects in vertebrate embryology and histology.

A practical course on histology, for beginners, will probably be given.

C.—PHYSIOLOGY.

DR. LOMBARD.

The work of next year will consist of lectures by DR. LOMBARD and others, research work, and practical laboratory work.

DR. LOMBARD will lecture upon the circulation of blood and lymph; respiration; nerve and muscle; and the spinal cord and brain. Further, it is possible that he will give a short course on the physiology of the special senses.

In addition to this a number of lectures will be given by Dr. Lombard and advanced students, upon special subjects in the line of their investigations.

A PRACTICAL LABORATORY COURSE will be offered. This will

occupy two hours a week, and will be intended for such students as have a good book-knowledge of physiology but lack practical training. The work will include the leading experiments of the preceding lectures. The character of the course will depend largely on the requirements of the students taking it.

Especial attention will be given to original work, and the laboratory will be open for this purpose throughout every week day. Either Dr. Lombard or his assistant will always be present. The apparatus is intended for use, and will be put at the disposal of every competent worker.

Opportunities will be given to men who wish to study experimentally special branches of physiology, with reference to their investigations in other departments of biology.

GEORGE BAUR, PH. D.,

Academy of Hohenheim, 1878-79; University of Munich, 1879-81; University of Leipzig, 1881-82; University of Munich, 1882; Ph. D., University of Munich, 1882; Assistant to Professor C. Kupffer, Munich, 1882-84; Assistant to Professor O. C. Marsh, Yale University, 1884-90.

Has been appointed Docent in Comparative Osteology and Paleontology, on which subjects he will lecture and conduct laboratory work.

LABORATORIES AND FACILITIES FOR WORK.

MORPHOLOGY.

The ROOMS occupied by the department of ANIMAL MORPHOLOGY are upon the third floor of the main building. The main laboratory is a large room, well lighted from the north side, and well adapted to microscopical research. It is furnished with large and commodious work-tables made from specially prepared designs, and with all the reagents, glassware, drawing-materials, etc., required in special work. The microscopes are made by Zeiss, and furnished with full sets of his apochromatic lenses and compensating eye pieces. Dissecting microscopes of the Zeiss-Mayer pattern, Thoma and Minot microtomes, water-baths, and other appliances necessary in biological investigation have also been supplied.

Five large aquaria, the largest being eight feet in length, have been placed in the laboratory. These are supplied with running water, making it possible to keep on hand during the winter a supply

of material for study and investigation. The numerous ponds in the vicinity of Worcester are convenient sources from which the aquaria may be stocked. Smaller glass aquaria, also supplied with running water, afforded opportunity for the rearing of special forms which are to be kept isolated.

THE LECTURE-ROOM, adjoining the main laboratory, is of convenient size, and is supplied with a full set of Leuckart & Nitsche's Zoölogical Charts, with a complete set of charts illustrating vertebrate embryology, and with Ziegler's Anatomical and Embryological wax-models. The nucleus of a collection of preserved specimens for lecture illustration has been provided, and a large number of specimens have been ordered from the Naples Zoölogical Station, which, with those already obtained, will form a collection containing representatives of all the principal groups of animals.

FOUR OTHER ROOMS, assigned to this department, serve as private laboratories for members of the staff.

ANATOMY.

A large room in the main building has been fitted up as an ANATOMICAL LABORATORY. It contains all the necessary apparatus required for histological and embryological research.

PHYSIOLOGY.

The PHYSIOLOGICAL LABORATORY consists of two large rooms, the one lighted by seven windows on the north the other by seven windows on the south side. In addition to these there is a room devoted to photography. There is an ample supply of gas and water, hoods and sinks. The furniture is solid and well suited to its purpose. It consists of cases for apparatus, and the multitude of small articles which are essential to every laboratory devoted to research; tables of various sizes and shapes, which are bracketed to the walls and hence freed from floor vibrations; and various articles designed for special uses.

The laboratory is well equipped with apparatus and instruments designed to measure and record physiological phenomena. Every piece was selected solely with reference to its usefulness in research work. In addition to these, there is an excellent supply

of tools for working metals, wood and glass. These are indispensable in a research laboratory, where every new problem presents new mechanical difficulties. The character of the apparatus will depend on the nature of the work. The laboratory is not a museum and only such forms of apparatus will be purchased as are adapted to actual use. It is the intention to supply as far as possible every facility for research.

INVESTIGATIONS BY MEMBERS OF THE DEPARTMENT OF BIOLOGY.

PROFESSOR WHITMAN has published the following :

The Embryology of Clepsine. *Quart. Journ. Mic. Sc.* 1878. Preliminary report *Zoölogischer Anzeiger*, No. 1, 1878. Changes Preliminary to Cleavage. *Prof. A. A. S.*, XXVII, 1878.

A Rare Form of the Blastoderm of the Chick, and its Bearing on the question of the Formation of the Vertebrate Embryo. *Quart. Journ. Mic. Sc.* XXIII, 1883.

The Flying Fish. *American Naturalist*, 1880.

Zoölogy in the University of Tokio. 1881.

Methods of Microscopical Research in the Zoölogical Station of Naples. *Amer. Nat.*, 1882.

The Naples Zoölogical Station. *Science*, 1883.

A New Species of Branchiobdella. *Zoölogischer Anzeiger*, 1882.

A Contribution to the Embryology, Life-history, and Classification of the Dicyemids. *Mittheilungen aus d. Zoöl. Station of Neapel*. IV, 1883.

On the Development of some Pelagic Fish Eggs. *Proc. Am. Acad. Arts and Sc.* XX, 1884. [Joint work with Alexander Agassiz.]

The External Morphology of the Leech. *Proc. Am. Acad. Arts and Sc.* XX, 1884.

The Segmental Sense-organs of Leeches. *Amer. Nat.* 1884.

The Pelagic Stages of Young Fishes. *Mem. Mus. Comp. Zoöl.* XIV. 1885. [Joint work with Alexander Agassiz.]

Methods in Microscopical Anatomy and Embryology. Boston, 1885.

The Germ-layers of Clepsine. *Zoöl. Anz.* No. 218, 1886.

The Leeches of Japan. *Quart. Journ. Mic. Sc.* 1886.

Biological Instruction in Universities. *Am. Naturalist*, 1887.

The Kinetic Phenomena of the Egg during Maturation and Fecundation. *Journ. Morph.* 1887.

A Contribution to the History of the Germ-layers in Clepsine. *Journ. Morph.* 1887.

The Seat of Formative and Regenerative Energy. *Journ. Morph.* 1888.

Some New Facts about the Hirudinea. *Journal of Morphology*, 1889.

The Development of Osseous Fishes. II. The Pre-embryonic Stages of Development. *Mem. Mus. Comp. Zoöl.* 1889.

PART FIRST.—The History of the Egg from Fertilization to Cleavage.

PART SECOND, embracing Cleavage and the Formation of the Germ-ring, is in course of preparation.

DR. LOMBARD

Is the author of the following researches in his department:

Beiträge zur Theorie der Wärmecmpfindung. Vorläufige Mitteilung. *Cent. f. d. Med. Wis.* 1883, No. 32.

Die räumliche und zeitliche anfeinanderfolge reflectorisch contrahirter Muskeln. *Arch. f. Anat. u. Physiol.*, 1885, p. 408.

Is the 'Knee-jerk' a Reflex Act? *Amer. Jour. of the Medical Sciences.* Jan., 1887, p. 88.

The Variations of the Normal 'Knee-jerk.' *Amer. Jour. of Psychol.* Oct., 1887. Translation of the above—"Die Variationen des normalen Kniestosses." *Arch. f. Anat. u. Physiol. Supplement band*, 1889, p. 292.

On the Nature of the "Knee-jerk." *Jour. of Physiol.* Vol. X, No. 1 and 2, p. 122.

The Effect of Fatigue on Voluntary Muscular Contraction. *Amer. Jour. of Psychol.* Jan., 1890. Translation of the above to appear in the next number of the *Archiv. Italiennes de Biologie*.

The results which have been obtained from the investigations which have been made in this department, will be published in due time. As much of this work is still in progress, it is undesirable to make a more explicit statement.

Under Dr. Lombard's direction,

DR. CARDWELL

Has been studying experimentally the physiology of the cerebellar cortex in cats and dogs, the results of which are not yet in proper form for publication.

DR. MALL

Is the author of the following researches, among many others, in his department:

Entwicklung der Branchialbogen und -Spalten des Hünchens. *His und Braune, Archiv.* 1887. Blut- und Lymphwege in Dünndarme des Hundes. *Abhandl. der K. Säch. Ges. d. Wiss.*, Bd. xiv.

Development of the Ear of the Chick. *Studies from the Biolog. Lab. J. H. U.*, 1888.

The Bronchial Clefts of the Dog. Studies from the Biolog. Lab. J. H. U., 1888.
Reticulated and Yellow Elastic Tissues. Anatomischer Anzeiger 1888.

DR. MALL has, during the present academic year, had the following subjects under investigation. Some of the results will soon be published.

1. The connective tissue fibrils.
2. Reconstruction of a human embryo, 26 days.
3. The histology of the lung.
4. The development, architecture and structure of the liver lobule.
5. Suture of the intestine.

Under the direction of Dr. Mall, DR. GAGE has been occupied with an investigation of the anatomy of the intestines; also

DR. MILLER has been engaged in an investigation upon the ending of the Bronchi and the relation of the arteries and veins to the Bronchi and air cells. Good progress has been made, and several new points have been brought out. Work will be continued in this line for some time to come. The University has furnished every facility for the carrying out of this work, and many fine preparations are the result. These are corrosions of the different sets of vessels in both wax and metal. More are to be made soon.

DR. McMURRICH has published the following papers:

On the origin of the so-called Test-cells in the Ascidian ovum—Studies from the Biolog. Lab. Johns Hopkins Univ. Vol. II, 1882. (Abstract in Biolog. Centralblatt II, 1882; Arch. de Zool. exp. et gén., X, 1882.)

Note on the function of the "test-cells" in Ascidian ova—Zoölog. Anzeiger V, 1882. (Abstract in Journ. Roy. Micros. Soc. II, 1882.)

On the Osteology and development of Syngnathus Peckianus (Storer)—Quart. Journ. Micr. Sci. XXIII, 1883. (Abstract in Johns Hopkins University Circular No. 27, 1883.)

The osteology and myology of *Amiurus catus* (L) Gill—Proceedings of the Canadian Institute, Toronto. N. S. Vol. II, 1884. (Preliminary notice in Zoölog. Anzeiger VII, 1884.)

On the structure and affinities of *Phytoptus*—Johns Hopkins University Circular, No. 35, 1884. (Abstract in Journ. Royal Micros. Soc. V, 1885.)

On the Tape-worm Epizootic among Lambs (*Taenia expansa*)—Ninth Annual Report of the Ontario Agricultural College, Toronto, 1884.

The cranial muscles of *Amia calva* (L), with a consideration of the Post-oc-

capital and Hypoglossal nerves in the various vertebrate groups—Studies from the Biolog. Lab. Johns Hopkins University, Vol. III, 1885. (Preliminary notice in Johns Hopkins University Circular, No. 38, 1885.)

On the existence of a post-oral band of cilia in Gasteropod Veligers—Johns Hopkins University Circulars, No. 43, 1885. (Abstract in Journ. Royal Micros. Soc., Vol. VI, 1886.)

A contribution to the Embryology of the Prosobranch Gasteropods—Studies from the Biolog. Lab. Johns Hopkins University, Vol. III, 1886. (Preliminary notice in Johns Hopkins University Circulars, No. 49, 1886; abstract in Journ. Royal Micros. Soc., VI, 1886.)

Notes on the Actiniæ obtained at Beaufort, N. C.—Studies from the Biolog. Lab. Johns Hopkins University, Vol. IV, 1887.

On the occurrence of an Edwardsia stage in the free-swimming embryos of a Hexactinian—Johns Hopkins University Circulars, No. 70, 1889. (Abstract in Journ. Royal Micros. Soc., IX, 1889.)

A contribution to the Actinology of the Bermudas—Proceedings of the Acad. of Nat. Sciences, Philadelphia, 1889. (Abstract in Journ. Royal Micros. Soc., IX, 1889.)

Note on the structure and systematic position of *Lebrunea neglecta*, Duch. and Mich.—Zoölog. Anzeiger XII, 1880. (Abstract in Journ. Royal Micros. Soc. IX, 1889.)

Article "Reproduction" in Buck's Reference Handbook of the Medical Sciences, Vol. VIII, 1889.

The Actiniaria of the Bahama Islands, W. I.—Journal of Morphology, Vol. III, 1889. (Abstract in Journ. Royal Micros. Soc. Vol. X, 1890; American Naturalist, 1889; Preliminary notice in Johns Hopkins University Circulars, No. 70, 1889.)

A paper entitled "Contributions on the Morphology of the Actinozoa. I. The structure of *Cerianthus Americanus*" will shortly be published in the Journal of Morphology.

Papers on the Actiniæ obtained by the U. S. Fish Commission Steamer 'Albatross' during the winter of 1887-8, and on the Embryology of the Actiniæ are also well under way.

DR. TUCKERMAN has published the following papers:

Some Observations in Reference to Bilateral Asymmetry of Form and Function.—Journ. Anat. Phys., Vol. XIX, 1885; Nature, 1885.

Supernumerary Leg in a Male Frog (*Rana palustris*).—Journ. Anat. Phys., Vol. XX, 1886. Plate.

The Tongue and Gustatory Organs of *Mephistic mephitica*.—Quart. Journ. Micr. Sci., Vol. XXVIII, N. S., 1887. Plate.

The Tongue and Gustatory Organs of *Fiber Zibethicus*. Journ. Anat. Phys., vol. xxii, 1888. Plate.

Note on the Papilla foliata and other Taste Areas of the Pig. Anat. Anzeiger, Jahrg. iii, 1888.

An interesting specimen of *Taeniasaginata*. Zoölog. Anzeiger, Jahrg. xi, 1888.
 The Anatomy of the Papilla Foliata of the Human Infant. Journ. Anat. Phys., Vol. xxii, 1888. Plate.

Antipyrine in Cephalalgia. N. Y. Med. Record, 1888.

Observations on the Structure of the Gustatory Organs of the Bat, (*Vespertilio subulatus*.) Journ. of Morph., Vol. ii, 1888. Plate.

Supplementary Note on *Taenia saginata*. Zoölog. Anzeiger, Jahrg. xi, 1888. Figures.

Anthropometric Data Relating to Students of the Massachusetts Agricultural College, Amherst, 1888.

On the Gustatory Organs of *Putorius vison*. Anat. Anzeiger, Jahrg. iii, 1888.

On the Gustatory Organs of *Vulpes vulgaris*. Journ. Anat. Phys., Vol. xxiii, 1889.

On the Gustatory Organs of *Arctomys monax*. Anat. Anzeiger, Jahrg. iv, 1889.

On the Development of the Taste-Organs of Man. Journ. Anat. Phys., Vol. xxiii, 1889.

On the Gustatory Organs of *Sciurus carolinensis*. The Microscope, Vol. ix, 1889. Plate.

On the Gustatory Organs of *Erethizon dorsatus*. Amer. Monthly Mico. Journ., Vol. X, 1889.

An undescribed Taste Area in *Perameles nasuta*. Anat. Anzeiger, Jahrg. iv, 1889. Figure.

On the Gustatory Organs of the American Hare, *Lepus Americanus*. Amer. Journ. Sci., Vol. xxxviii, 1889.

Note on the Tongue of *Chrysotis aestiva*. The Microscope, Vol. ix, 1889.

The Gustatory Organs of *Beldeus ariel*. Journ. Anat. Phys., Vol. xxiv, 1889. Plate.

Further Observations on the Development of the Taste-Organs of Man. Journ. Anat. Phys., Vol. xxiv, 1889.

The Gustatory Organs of *Procyon lotor*. Journ. Anat. Phys., Vol. xxiv, 1890. Plate.

On the Gustatory Organs of *Sciurus hudsonius*. The Microscope, Vol. x, 1890. Plate.

On the Gustatory Organs of the Mammalia. Proc. Bost. Soc. Nat. Hist., Vol. xxiv, 1890.

On the Gustatory Organs of some Edentata. Interna. Monatsseh. f. Anat. u. Phys., Vol. vii, 1890.

On the Gustatory Organs of some of the Mammalia. Journ. Morph., vol. iv, 1890.

Other papers are in course of preparation, including a work on the comparative histology of the organs of taste of the mammalia. He has been at work upon the comparative anatomy of the taste-organs of the Marsupialia, Edentata, Rodentia, Insectivora, Chiroptera, Ungulata, Carnivora, Inadonmana, and

other mammals, and the results are now being prepared for publication.

MR. H. C. BUMPUS has printed :

- "Studies in Zoölogy,"—American Teacher, 1886.
- "Reptiles and Batrachians of Rhode Island."—Random Notes on Natural History, Vol. II, III, '85-'86.
- "Reptilia," in Standard Nat. History, Vol. III, '85.
- "An inexpensive self-registering anaxanometer."—Botanical Gazette, Vol. XII, 1887.

He has spent the year in research upon the embryology of Crustacea, especial attention having been given to the American lobster. The first part embracing the cleavage of the ovum, and the germ layer, is nearly ready for publication.

DR. BAUR has published as follows :

Der Tarsus der Voegel und Dinosaurier, eine morphologische Studie. Morph. Jahrbuch, vol. viii, 1882. pp. 417-456, 2 pl. Also separate, as Inaugural Dissertation.

Der Carpus der Paarhufer. Eine morphogenetische Studie. Morph. Tahrbuch, vol. ix, 1884. pp. 597-603.

Dinosaurier und Voegel. Eine Erwiderung au Herrn Prof. W. Dames in Berlin. Morph. Jahrbuch, vol. x, 1885. pp. 446-454.

Bemerkungen ueber das Becken der Voegel und Dinosaurier. Morph. Jahrbuch, Bd. x, 1885. pp. 613-616.

The same Amer. Naturalist. Dec. 1884. pp. 1273-1275.

Zur Morphologie des Tarsus der Säugethiere. Morph. Jahrb., vol. x, 10, 1885. pp. 458-461. The same, Amer. Naturalist, Jan., 1885. pp. 87-88.

Ueber das Centrale carpi der Säugethiere. Morph. Tahr., vol. x, 1885. pp. 455-457. The same, Amer. Naturalist., Feb., 1885. pp. 195-196.

Das Trapezium der Camelden. Morph. Jahrb., vol. x, 1885. pp. 117-118. The same, Amer. Naturalist, Feb., 1885. pp. 196-197.

A second phalanx in the third digit of a Carinate Bird's wing. Science, May 1, 1885. p. 355.

A complete Fibula in an adult living Carinate Bird. Science, May 8, 1885. p. 375.

On the Morphology of the Carpus and Tarsus of the Vertebrates. Amer. Naturalist, July, 1885. pp. 718-720.

Zur Morphologie des Carpus und Tarsus der Wirbelthiere. Zoölog. Anz., No. 196, 1885. pp. 326-329.

Zur Voegel, Dinosaurier, Frage. Zöol. Anz., No. 200, 1885. pp. 441-443.

Nachtraegliche Bemerkungen zu : zur Morphologie des Carpus und Tarsus der

Wirbelthiere. (Zoöl. Anz., 1885, No. 196). Zoöl. Anz., No. 202, 1885. pp. 486-488.

Zum Tarsus der Voegel. Zoöl. Anz., No. 202, 1885. p. 488.

"Note on the Sternal Apparatus in Iguansdon." Zoöl. Anz., No. 205, 1885. pp. 561-562.

Einige Bemerkungen über die Ossification der "langen" Knochen. Zoöl. Anz. 206, 1885. pp. 580-581.

Bemerkungen über den "Astragalus" und das Intermedium tarsi der Säugethiere. Morph. Jahrb., vol. ii, 1885. pp. 468-483, 1 pl.

Zur Morphologie des Carpus und Tarsus der Reptilien. Zoöl. Anz., No. 208, 1885. pp. 631-638.

Über das Archipterygium und die Entwicklung des Cheiropterygium aus dem Ichthyopterygium. Zoöl. Anz., No. 209, 1885. pp. 663-666.

Preliminary note on the Origin of Limbs. Amer. Natur., Nov., 1885. p. 1112.

Historische Bemerkungen. Internat. Monatschr. f. Anat. und Histol., vol. iii, 1886. pp. 1-5.

Der älteste Tarsus. (Archegosaurus) Zoöl. Anz., No. 216, 1886. pp. 104-106.

The same, Amer. Natur., Feb., 1886. pp. 173-174.

W. K. Parker's Bemerkungen über Archaeopteryx, 1864, und eine zusammenstellung hauptsächlichsten litteratur über diesen Voegel. Zoöl. Anz., No. 216, 1886. pp. 106-109.

The Intercentrum of living Reptilia. Amer. Natur., Feb., 1886. p. 174.

The ProAtlas, Atlas and Axis of the Crocodilia. Am. Nat., March, 1886. pp. 288-293. (Woodcuts).

Die zwei Centralia im Carpus von Sphenodon (Hatteria) und die Wirbel von Sphenodon und Gecko verticillatus, Laur. (G. verus Gray). Zoöl. Anz., No. 219, 1886. pp. 188-190.

Herrn Professor K. Bardeleben's Bemerkungen über "Centetes madagascariensis." Zoöl. Anz., No. 220, 1886. pp. 219-220.

Über die Kanäle im Humerus der Amnioten. Morph. Jahrb., 1886. pp. 299-305.

Bemerkungen über Sauropterygia und Ichthyopterygia. Zoöl. Anz., No. 221, 1886. pp. 245-252.

Über das Quadratum der Säugethiere. Gesellsch. für Morphol. und Phys. München, 1886. pp. 45-57. The same, Biol. Centralbl., vi, 1886, pp. 648-658; and Quart. Journ. Microsc. Science, 1887. pp. 169-180. Translated by Wm. B. Benham.

Über die Morphogenie der Wirbelsäule der Amnioten. Biol. Centralblatt, vol. vi, No. 11 and 12, 1886. pp. 332-342; 353-363.

The Intercentrum in Sphenodon (Hatteria). Amer. Nat., May, 1886. p. 465.

Berichtigung. Zoöl. Anz., No. 223, 1886. p. 323.

The Ribs of Sphenodon (Hatteria). Amer. Nat., Nov., 1886. pp. 979-980.

Über die Homologien einiger Schädelsknochen der Stegocephalen und Reptilien. Anat. Anz., 1886, No. 13. pp. 348-350.

Osteologische Notizen über Reptilien. Zoöl. Anz., No. 238, 1886. pp. 685-690.

Osteologische Notizen über Reptilien, Fortsetzung I. Zoöl. Anz., No. 240, 1886. pp. 733-743.

On the Morphogeny of the Carapace of the Testudinata. Am. Nat., Jan., 1887. p. 89.

Osteologische Notizen über Reptilien, Fortsetzung II. Zoöl. Anz., No. 244, 1887. pp. 96-102.

Erwiderung an Herrn Dr. A. Guenther. Zoöl. Anz., No. 245, 1887. pp. 120-121.

Über Lepidosiren paradoxa Fitzinger. Zoöl. Jahrbucher, vol. ii, 1887. pp. 575-583.

Nachtraegliche Notiz zu meinen Bemerkungen. "Über die Homologieen einiger Schaedelknochen der Stegocephalen und Reptilien," in Nr. 13 des ersten Jahrganges dieser Zeitschrift. Anat. Anz., No. 21, 1887. pp. 657-658.

On the Phylogenetic Arrangement of the Sauropsida. Journ. of Morphology, vol. i. 1887. pp. 93-104.

Über die Abstammung der Amnioten Wirbelthiere. Gesellsch. f. Morphologie and Phys. Munchen, 1887. pp. 46-61. The same, Biol. Centralbl., vol. vii, 1887. pp. 481-493.

On the Morphology and Origin of the Ichthyopterygia. Amer. Natur., Sept., 1887. pp. 837-840.

On the Morphology of Ribs. Amer. Natur., Oct., 1887. pp. 942-945.

Beiträge zur Morphogenie des Carpus und Tarsus der Vertebraten. I. Theil, Batrachia. Jena, 1888. p. 86, 3 pl.

Über den Ursprung der Extremitäten der Ichthyopterygia. Bericht. xx, Vers. Oberrhein. Geol. Ver. Stuttgart, 1888. pp. 17-20, 1 pl.

Dermochelys, Dermotochelys, oder Sphargis. Zool. Anz., No. 270 1888. pp. 44-45.

Unusual Dermal Ossifications. Science, March 23, 1888. p. 144.

Notes on the American Trionychidæ. Amer. Natur., Dec., 1888. pp. 1121-1122.

The Theory of the Origin of Species by Natural Selection. Amer. Natur., Dec., 1888. p. 1144.

Osteologische Notizen über Reptilien. Fortsetzung III. Zoöl. Anz., No. 285, 1888. pp. 417-424.

Osteologische Notizen über Reptilien. Fortsetzung IV. Zoöl. Anz., No. 291, 1888. pp. 592-597.

Osteologische Notizen über Reptilien. Fortsetzung V. Zoöl. Anz., No. 296, 1888. pp. 736-740.

Osteologische Notizen über Reptilien. Fortsetzung VI. Zoöl. Anz., No. 298, 1889. pp. 40-47.

Revision meiner Mittheilungen im Zoologischen Anzeiger mit Nachtraegen. Zoöl. Anz. No. 306, 1889. pp. 238-243.

Neue Beitræge zur Morphologie des Carpus der Säugethiere. Anat. Anz. 1889. No. 2. pp. 49-51 4 fig.

The systematic Position of Meiolania. Owen. Ann. and Mag. Nat. Hist. Jan. 1889. pp. 54-62.

On Autacochelys Lydeker, and the Systematic Position of Anosteira, Seicly, and Pseudotrionyx, Dollo. Ann. Mag. Nat. Hist. Mar. 1889. pp. 273-276

On Meiolania and some points in the osteology of the Testudinata; a reply to Mr. G. A. Boulenger. 1 Pl. Ann. Mag. Nat. Hist. July 1889. pp. 37-45.

Mr. E. T. Newton on Pterosauria. Geol. Magaz. April 1889. pp. 171-174.

Die Systematische Stellung von Dermochelys, Blainv. Biol. Centralbl. 1889. No. 5 and 6. pp. 149-153, 180-191.

Nachtraegliche Bemerkungen über die Systematische Stellung von Dermo-
chelys, Blainv. Biol. Centralbl. 1889. No. 20 and 21. pp. 617-619.

Palaeohatteri Credner, and the Proganosauria. Amer. Journ. Science. April
1889. pp. 310-313.

Kadaliosamus priscus credner, a new Reptile from the Lower Permian of
Saxony. Am. Journ. Sci. Feb. 1890. pp. 156-158.

Bemerkungen uber den Carpus der Probiscidier und der Ungulaten im
Allgemeinen. Moph. Jahrb. Vol. XV. 1890. pp. 478-482. 1 fig.

On the morphology of ribs and the fate of the Actinosis of the Median Fins
in Fishes. Journ. of Morph. Vol. III. 1889. pp. 463-466. (fig)

On the Morphology of the Vertebrate Skull. Journ. of Morphol. Vol. III.
1889. pp. 467-474.

A Review of the Charges Against the Paleontological Department of the U. S.
Geological Survey, and of the Defence made by Prof. O. C. Marsh. Amer
Nat. March 1890. pp. 298-304.

V.

PSYCHOLOGY.

WORK OF THE PAST YEAR.

Instruction in this department has been given by

G. STANLEY HALL, PH. D., Temporary Professor of Psychology.

H. H. DONALDSON, PH. D., Assistant Professor of Neurology.

E. C. SANFORD, PH. D., Instructor in Experimental Psychology.

F. BOAS, PH. D., Docent in Anthropology.

A. MACDONALD, PH. D., Docent in Practical Ethics.

B. C. BURT, A. M., Docent in The History of Philosophy.

A. COOK, PH. D., Docent in History of Philosophy and Ethics.

C. F. HODGE, PH. D., Fellow in Psychology.

The President of the University was appointed temporary Professor of Psychology, but, owing to the pressure of official duties, has been able to give but comparatively little instruction.

A.—NEUROLOGY.

ASSISTANT PROFESSOR DONALDSON has lectured through the year on the Anatomy of the Central Nervous System in Man. These lectures were illustrated by the exhibition of specimens, models, and the works of the principal investigators.

A seminary, meeting once a week, has devoted a dozen sessions to the consideration of localization in the central nervous system, viewing the subject historically.

B.—EXPERIMENTAL PSYCHOLOGY.

DR. SANFORD held informal weekly conferences during the first few weeks. In November he began a detailed course of lectures on Reaction-Times, treating first the physiological part of the pro-

cess of reaction (rate of nervous conduction in sensory and motor nerves, latency of the stimulus in the sense organs, etc.), then the more distinctly psychophysical parts (sensory and motor forms of reaction, effect of intensity and place of stimulus, of attention, of complicating the stimulus or response, "personal equation," etc.), and finally considering the time relations of mental associations. Methods of experiment were explained, and demonstrations made in connection with this course. In March, Dr. Sanford began a course of lectures upon the Color Sense, with special reference to Helmholtz and Hering. The remainder of the year was devoted to Binocular Vision. Each course has been copiously illustrated by demonstrations.

Dr. Sanford has also directed the demonstrational and research work in the psychological laboratory, and has acted as publisher of the *American Journal of Psychology*, which is edited by Dr. G. S. Hall.

C.—ANTHROPOLOGY.

DR. BOAS has given two courses of lectures, one upon the Anthropology of North America.

In this course of lectures the distribution, physical characters, languages, inventions, customs and beliefs of the various tribes were taken up in succession, beginning in Arctic America and proceeding southward along the Pacific Coast after which the tribes east of the Rocky Mountains were treated. Particular stress was laid on the diffusion of cultural elements all through North America. A second course of lectures "on Methods of Anthropological Investigation" was intended to serve as an introduction into the subject. The methods of describing and measuring skeletons and living individuals formed the subject of the lectures until Christmas. In this course the use of anthropological apparatus was explained. Later on, the subjects of language, social institutions, religion, and customs were treated briefly in this order.

In the anthropological laboratory two courses, each of two hours weekly were held. The first of these had for its object an introduction into the methods of field investigation. Anthropome-

try and language were the principal subjects taught. The second course related to anthropometry especially to craniometry.

In the months of March and April a seminary on "Shamanism" was held. The practices of the "medicine men" were described and discussed and compared with the magic of the middle ages. The abnormal states of mind, forming part and parcel of the shamanistic rites were treated and the connection between trances, hallucinations, hypnotism and allied states, was pointed out. Finally various theories of shamanism were discussed.

D.—PRACTICAL ETHICS, (Criminology.)

DR. MACDONALD—Docent in practical Ethics, has devoted his entire time this year to the subject of criminology. His lectures have treated crime from the standpoints of Anatomy, Psychology, Sociology, Statistics, Prophylaxy and Teratology. The standpoint of the lecturer has been that as mental diseases may be utilized by the student of Psychology as nature's experiments in his field, so crime may be studied as the most objective way of approaching the great problems of right, duty and freedom of choice.

E.—PHILOSOPHY.

MR. BURT has conducted courses in the history of Philosophy throughout the year. In connection with his lectures upon Greek Philosophy a seminary was held for the critical reading and study of Platonic Dialogues, twelve of which were completed. Here the attempt was made to understand not only the Dialogues themselves but the psychologic development of Plato's conceptions with special reference to the modern theories of that development. A few meetings the last of the year were devoted to Aristotle's metaphysics and particularly the Categories. In general it was sought to present the field of ancient philosophy in a way to make clear how fundamental is the necessity of studying modern conceptions of philosophy, religion and science in their fresh original fulness among the ancient Greeks in order to understand them.

Mr. Burt also gave during the latter part of the year a course of lectures upon the modern Philosophy before Kant.

DR. COOK has devoted the year to the history of modern philosophy from Kant to Locke, both included. He has attempted a genetic history of philosophy as distinct from its chronological-unfoldment. His standpoint is mainly that of Kant.

WORK OF NEXT YEAR.

DR. HALL. PSYCHOLOGY AND EDUCATION.

Dr. Hall will direct next year the work of a few special students in both Psychology and Education. His special announcements will be made later.

DR. DONALDSON. NEUROLOGY.

The work of next year will be in the direction of further research along neurological lines, seminary work on some selected subjects, and lectures and demonstrations on the anatomy of the central nervous system and sense organs—the precise form of which will be determined by the needs of those students who present themselves in the fall.

DR. SANFORD. EXPERIMENTAL PSYCHOLOGY.

Next year DR. SANFORD will first lecture upon the Psychology of Hearing, Taste, Smell and Touch. Later in the year he will lecture upon the Psycho-Physic law and upon the experimental treatment of Memory, Attention, etc. Demonstrations will be given as important a place as possible.

DR. BOAS. ANTHROPOLOGY.

DR. BOAS will, during the next year, give the following courses :

1. Physical Anthropolgy, Osteology, particularly craniology. Physical character in the living subject. Anatomy of races.

In connection with the course of lectures, practical work on methods of studying the anatomy of races will be conducted in the anthropological laboratory.

2. Anthropology of Africa. Geographical distribution, physical characters, languages and culture of the native tribes of Africa.

In the spring a special course of lectures will be given on "American Myths."

WILLIAM H. BURNHAM, Ph. D., Docent in Pedagogy.

A. B., Harvard University, 1882; Fellow Johns Hopkins University, 1885-86, and Instructor, 1888-89; Ph. D., 1888.

Will lecture and conduct seminary work on the History and Methods of Education. A detailed announcement of these courses will be made later.

FACILITIES.

The **NEUROLOGICAL LABORATORY** consists of one large room (21 x 40 ft.) and one smaller room, which have been furnished and equipped for this work alone. It is under the direction of DR. DONALDSON, assisted by DR. C. F. HODGE. It affords all needed facilities for verification and investigation in the field of Neurology, and is well furnished with apparatus for histological work. It contains also a good equipment of illustrative apparatus, such as a model of the human brain, by Aeby; a large dissectible brain, medulla and cord, by Auzou; Ziegler's models of animal brains, etc. The collection of Neurological literature, both current and historical, is unusually extensive.

The **PSYCHOLOGICAL LABORATORY** has been apportioned a suite of rooms on the second floor, consisting of one large and two small rooms. The large room is used as a general laboratory and lecture room; one of the smaller rooms is used by the instructor as an office and as a room in which the subject may be placed in reaction-time experiments to avoid the sound of the chronoscope. During the past year by the courtesy of Dr. Lombard the physiological laboratory has been used for psychological work of special kinds.

The department is well supplied with apparatus for time measurements and psychological optics. There are now in the laboratory or in construction (for the first purpose): The Hipp chronoscope with its various appliances, the Wundt chronograph for very small intervals, the Cattell fall-chronometer, a pendulum myograph, Bowditch's neuromobimeter, Wundt's time-sense apparatus, Wundt's apparatus for presentation of simultaneous stim-

uli, "personal equation" machine of Eastman after a model in the National Observatory, several pendulums constructed in the laboratory for special purposes, revolving drum, time-markers, Koenig's forks, etc. For psychological optics: Large disk color-mixer of Krille, small color mixer with horizontal disk by Rothe of Prag, such as was used by Dr. Hess in his recent studies of color vision in the indirect field. Holmgren's chromatiskiameter, Priestly Smith's perimeter, Donder's Horopterscope, Phaenophthalmotrope of Donder's, Snellen's phakometer, tests for color blindness, ophthalmotrope, ophthalmoscope Kühne's model of the eye, instruments used by Drs. Hall and Bowdich in studying visual illusions of motion, stereoscopes, test lenses, etc., etc.

Of apparatus for other purposes the laboratory has: A large induction coil for sparks, Du Bois-Reymond sliding induction coil, electric motor, harmonical (devised by Ellis for study of tone on principles of Helmholtz) with set of carefully tested tuning forks, most of Galton's anthropometric apparatus, aesthesiometric compasses, laryngoscope, apparatus for mapping heat and cold spots on the skin, Mosso's bed, batteries, etc., etc. The laboratory has been open during the year for those who, while giving other work their chief attention, desire to learn something at first hand of psycho-physic apparatus and its use in the standard experiments, and for those carrying on original research in psychological lines.

The ANTHROPOLOGICAL DEPARTMENT has two rooms fitted up with craniometric and anthropological journals and is well provided with books on anthropological subjects. In the laboratory opportunity is offered to become acquainted with the use of anthropological instruments and with the application of anthropological methods. Original investigations were carried on by Dr. Boas on material collected on the North Pacific Coast.

STUDIES BY MEMBERS OF THE DEPARTMENT OF PSYCHOLOGY.

DR. G. S. HALL has published as follows:

EXPERIMENTAL.

The Perception of Color." *Proc. Am. Acad., Arts and Sci.*, March, 1878.
Laura Bridgman." *Mind*, April, 1879.

Ueber die Abhängigkeit der Reactionszeiten vom Ort des Reizes with Dr. Kries. *Archiv für Anat. und Physiol.*, 1879.

Die willkürliche Muskelaction with Professor Kronecker. (*Ibid*, 1879)

The Muscular Perception of Space. *Mind*, 1879.

Hegel: His Followers and Critics. *Journal of Speculative Philosophy*, 1880.

Optical Illusions of Motion with Professor H. P. Bowditch. *Jour. of Physiol.*, Vol. III, No. 5.

Contents of Children's Minds. *Princeton Review*, May, 1883.

Bilateral Asymmetry of Function with E. M. Hartwell. *Mind*, No. 33.

Reaction Time and Attention in the Hypnotic State. *Mind*, No. 30.

Studies of Rhythm. *Mind*, Vol. XI, No. 41.

Motor Sensations of the Skin, with Dr. H. H. Donaldson. *Mind*, No. 40.

Dermal Sensitiveness to Gradual Pressure Changes. *Am. Jour. of Psychol.*, 1887.

Other contributions to the *American Journal of Psychology*, of which he is Editor.

EDUCATIONAL.

Philosophy in the United States. *Pop. Sci. Monthly, Supp.*, No. 1, 1879.

Moral and Religious Training of Children. *Princeton Review*, Jan., 1883.

The Education of the Will. *Princeton Rev.*, Nov., 1882.

The New Psychology. Opening Lecture, Johns Hopkins University, Fall of 1884. *Andover Review*, March and May, 1885.

How to Teach Reading and What to Read in Schools. D. C. Heath, Boston, 1887.

Bibliography Education with J. M. Mansfield. Book of 300 pp., Ginn & Co., Boston, 1886.

New Departure in Education. *N. A. Review*, Feb., 1885.

Aspects of German Culture. Book of 318 pp., Osgood, Boston, 1881.

Methods of Teaching History. Editor, Book of 385 pp., Boston, 1885.

A Sand Pile. *Scribner's Mag.*, Jan., 1888.

Children's Lies. *Am. Jour. of Psychol.*, Jan., 1890).

Many Educational Addresses.

Several other articles and studies are either ready for publication, or under way.

DR. DONALDSON is author of the following researches :

On the Detection and Determination of Arsenic in Organic Matter. [Under Prof. R. H. Chittenden.] *Am. Chemical Journal* Vol. II, No. 4.

The Influence of Digitaline on the Work of the Heart and on the Flow through the Blood-vessels. [With Dr. L. T. Stevens.] *Jour. of Physiology*, Vol. IX, No. 2.

Motor Sensations of the Skin. [Under G. Stanley Hall.] *Mind*, No. XL.

On the Temperature-Sense. *Mind*, No. XXXIX.

On the Relation of Neurology to Psychology. *Am. Journal of Psychology*, Vol. I, 1888.

Investigations have been conducted on the physiology and anatomy of nerve cells in the spinal ganglia; on the relations between the growth of a limb and the growth of the nerve centers and the nerve connected with it; and on the histology of the cerebellar cortex. A description of the brain of the blind deaf-mute, Laura Bridgman, has been begun.

DR. C. F. HODGE has presented several special papers and lectures on the physiology of the nervous system. He is engaged upon a research concerning the morphological modifications found in nerve cells as a result of stimulation. He is also writing the *History of Reflex Action*, and has been preparing an extensive series of microscopic specimens to illustrate the anatomy of the central nervous system.

DR. SANFORD is author of the following original studies:

The Writings of Laura Bridgman, two articles in the *Overland Monthly*, 1886-7.

The Relative Legibility of the Small Letters. *Am. Jour. of Psy.*, May, 1888.

Personal Equation. Three articles in the *Am. Jour. of Psy.*, Nov., 1888; Feb. and May, 1889.

The following points have been made the subject of investigation by Dr. Sanford: 1. Is reaction quicker when the stimulus is received in the reacting hand, or in the other? 2. Is reaction-time modified by the number of muscles brought into action? 3. Determination of the numerical index of force exerted by more or less complex concepts on the simple sensations which call them up. 4. Theoretical construction of a new chronoscope.

MR. HERBERT NICHOLS has been engaged upon a successful research on the determination, measurement, and physiological location of certain phenomena of time-sense, particularly with reference to apparently conflicting results between German and American investigators.

DR. BOAS is the author of the following studies:

Beiträge zur Erkenntniss der Farbe des Wassers. Inaugural-Dissertation, Kiel, 1881.

Ein Beweis des Talbotschen Satzes. *Ann. der Phys. und Chem.*, 1882, p. 359-362.

Über eine neue Form des Gesetzes der Unterschiedsschwelle. *Pflüger's Archiv.*, 1881, p. 493-500.

Ueber die verschiedenen Formen des Unterschiedsschwellenwerthes. Ibid. 1882, p. 214-222.

Die Bestimmung der Unterschiedsempfindlichkeit nach der Methode der richtigen und falschen Fälle. Ibid. 1882, p. 84-94.

Die Bestimmung der Unterschiedsempfindlichkeit nach der Methode der übermerklichen Unterschiede, 1882, p. 562-566.

Über den Unterschiedsschwellenwerth als Maass der Intensität psychischer Vorgänge. Philos. Monatshefte, 1882, p. 367-375.

Die Grundaufgabe der Psychophysik. Pflügers' Archiv, 1882, p. 566-576.

Ueber die ehemalige Verbreitung der Eskimo im Arktisch Amerikanischen Archipel. Ztsch. Ges. der Erdk. Berlin, 1883, p. 118-136.

Baffinland, Geographische Ergebnisse einer in den Jahren 1883 und 1884 unternommenen Forschungsreise, Gotha. Justus Perthes, 1885, p. 1-100.

Bemerkungen zur Topographie der Hudson Bay und Hudson Strasse. Pet. Mitt., 1885, p. 424-426.

Die Sprache der Bella Coola Indianer. Verh. Anthr. Ges. Berlin, 1886, p. 202-206.

Zur Ethnologie von Britisch Columbien. Pet. Mitt. 1887, No. 5.

Mitteilungen über die Vilkula Indianer. Original Mitteilungen Mus. für Völkerkunde, Berlin.

Notes on the Ethnology of British Columbia. Proc. Am. Phil. Soc. 1887, p. 422-428.

Census and Reservations of the Kwakiutl. Bull. Am. Geogr. Soc., 1887.

On Certain Songs and Dances of the Kwakiutl. Journ. Am. Folk-Lore, 1888, p. 49-64.

Die Mythologie der nordwestamerikanischen Küstenstämme. Globus, 1887-88.

Bericht über die Fortschritte der Erforschung Nord-Amerikas. Behm und Wagner's Geogr. Jahrbuch, XII, p. 73-104.

Meteorologische Beobachtungen im Cumberland Sunde. Ann. der Hydr., 1888, p. 241-262.

Myths and Legends of the Čatloltq. Am. Antiquarian, 1888, p. 201-211.

The game of Cat's Cradle. Int. Archiv für Ethnogr. 1888.

Chinook Songs. Journ. Am. Folk-Lore, 1888, p. 220-226.

Sagen der Eskimo von Baffinland. Verh. Ges., Berlin, 1888, p. 394-405.

Die Tsimschian, Ztschr. für Ethn., 1888, p. 231-247.

The study of Geography, Science, 1887, p. 137.

The Central Eskimo. Sixth Annual Rep. Bur. of Ethn., p. 399-669.

The Houses of the Kwakiutl Indians. Proc. U. S. Nat. Mus. 1888, p. 123-131.

Notes on the Snanaimuq. Am. Anthr. 1889, p. 321-328.

The Indians of British Columbia. Trans. Roy. Soc. of Can., 1888, II, p. 47-57.

Fourth Report of the Committee of the British Association for the Advancement of Science, on the Northwestern Tribes of Canada, p. 1-10.

Fifth Report of the same Committee, p. 1-96.

On Alternating Sounds. Am. Anthr., 1889, p. 47-53.

The Development of the Culture of Northwest America. Science, XII, p. 194.

On the use of masks and head ornaments on the northwest coast of America. Internat. Arch. für Ethnogr. 1890.

DR. BOAS completed a monograph of the mythologies of the North Pacific coast and carried on researches on the anthropology of the same tribes based on material collected on several journeys.

DR. McDONALD has commenced several lines of investigation upon criminals, including anthropometric, psychical and anamnestic and other examinations. While attempting a scientific study of criminals, the broader philosophical aspects of the ethical problems in this field are no less carefully and fully considered.

DR. HODGE has printed the following papers :

Some Effects of Stimulating Ganglion Cells, Prelim. Comm. Am. Jour. Psy., May, 1888.

Some Effects of Electrically Stimulating Ganglion Cells.—Am. Jour. Psychology, May, 1889.

A study of the oyster beds of Long Island Sound, with reference to the ravages of Star-fish,—Johns Hopkins Circular, 1889.

The next step in the study of nerve cell stimulation, viz., with reference to the behavior of the cells after exhaustion, has been taken; and results have been obtained to show that nerve cells, like gland cells in general, tend to return to normal after stimulation. Work upon the minute structure of the spinal ganglia of shark and frog has also been continued throughout the year.

MR. BURT.

"Brief History of Greek Philosophy." (Ginn & Co., Boston.)

Translation of "Erdmann's History of Philosophy from Kant to Hegel." (Swann, Sonnenschein & Co.)

"Shakespeare in the opinion of the 17th Century." New Englander, 1881.

"Watson's Kant and His English Critics." Unitarian Review 1882.

Series of Articles on "Greek Philosophy." Unity, Chicago, 1884-85.

"Some Relations between Philosophy and Literature." Pub. of Philos. Soc., Michigan University, 1886.

"Philosophical Works of Professor George S. Morris." Chronicle, 1889.

"German Philosophy Since Hegel." Education, April and May, 1890.

"References for Students in English Literature." Pamphlet, 1887.

Mr. Burt is now engaged in writing a history of Modern Philosophy.

DR. COOK has written :

Ueber die Beckeleyesche Philosophie.

"Natural Law and Free-will, a Dissertation on the Kantian Philosophy."

Dr. Cook is engaged on a Treatise in the field of Psychology.

Mr. Dickinson S. Miller has nearly completed a dissertation upon categories.

Mr. E. A. Kirkpatrick is at work upon a book which is now well under way.

DEPARTMENT OF MODERN LANGUAGES.

The work in this department has been under the charge of MR. CAMILLE RIED throughout the year. The object of instruction in this department has been to give to those scientific students who desired it further practical knowledge of modern languages that they might better command the literature of their own special departments. Work in scientific philology, or in the study of literature as such, has not been attempted.

During the past year there have been no beginners in any language.

In German the work has been as follows :

Class I. Whitney's Grammer "Bilderbuch ohne Bilder" by Anderson; "Germelshausen" by Fr. Gertäcker; "Höher als die Kirche" by Von Hillern; and exercises in conversation.

Class II. Goethe's Italienische Reise, read with a special view to construction.

Class III. Read Wundt's "Grundzüge der physiologische Psychologie" 300 pages in class and the rest in private. Special attention was given here to syntax and the exact meaning of technical terms in physiology, anatomy etc., which were treated critically as to both origin and use.

In French Class I. read Oger's edition of Voltaire's "Siècle de Louis XIV" special attention being given to pronunciation.

Class II. read "La psychologie de l'attention" "Le maladie de la personnalité" both by Professor Th. Ribot.

HISTORY AND BUILDINGS.

Clark University was founded by the munificence of a native of Worcester County, whose plans, conceived more than twenty years ago, have gradually grown with his fortune.

He has done so with the strong and express desire that the highest possible academic standards be here forever maintained ; that special opportunities and inducements be offered to research ; that to this end the instructors be not over-burdened with teaching or examinations ; that all available experience, both of older countries and our own, be freely utilized, and that new measures, even innovations, if really helpful to the highest needs of modern science and culture be no less freely adopted ; in fine, that the opportunities of a new foundation in this land and age be diligently explored and improved.

He has chosen Worcester as the seat of the new foundation after mature deliberation—first ;

Because its location is central among the best colleges of the East, and by supplementing rather than duplicating their work, he hopes to advance all their interests and to secure their good will and active support, that, together, further steps may be taken in the development of superior education in New England ; and secondly ;

Because he believes the culture of this city will ensure

that enlightened public opinion indispensable in maintaining these educational standards at their highest; and that its wealth will ensure the perpetual increase of revenue required by the rapid progress of science.

As the first positive step towards the realization of his long-formed plans, MR. CLARK invited the following gentlemen to constitute with himself a Board of Trustees:

STEPHEN SALISBURY,

A. B., Harvard, 1856, Universities of Paris and Berlin, 1856-58; Harvard Law School, 1859-61; President Antiquarian Society since 1887.

CHARLES DEVENS,

A. B., Harvard, 1838; Harvard Law School, 1840; Major-General, 1862; Judge of Supreme Court, 1857; United States Attorney General, 1877-81; LL. D. Columbia and Harvard, 1877; Judge Supreme Court since 1881.

GEORGE F. HOAR,

A. B., Harvard, 1846; Harvard Law School, 1849; United States House of Representatives, 1868-76; United States Senate since 1876; LL. D., William and Mary, Amherst, Harvard and Yale.

WILLIAM W. RICE,

A. B., Bowdoin, 1846; admitted to Bar, 1854; United States House of Representatives; 1876-86; LL. D., Bowdoin, 1886.

*** JOSEPH SARGENT,**

A. B., Harvard, 1834; M. D., Harvard, 1837; London and Paris Hospitals, 1838-40.

JOHN D. WASHBURN,

A. B., Harvard, 1853; Harvard Law School, 1856; Representative, 1876-79; State Senate, 1887; United States Minister to Switzerland, 1889.

FRANK P. GOULDING,

A. B., Dartmouth, 1863; Harvard Law School, 1866; City Solicitor since 1881.

GEORGE SWAN,

A. B., Amherst, 1847; admitted to Bar, 1851; Member of Worcester School Board since 1879; Chairman of High School Committee.

To fill the vacancy in the Board caused by the death of Dr. Joseph Sargent, the unanimous choice of the Trustees, at a meeting held October 2d, 1889, fell upon

EDWARD COWLES,

A. B., Dartmouth, 1859; M. D., Dartmouth, 1862, and College of Physicians

* Died October 12, 1888.

and Surgeons, N. Y., 1863; Assistant Surgeon U. S. A., 1863-72; Resident Physician and Superintendent Boston City Hospital, 1872-79; Med. Supt. McLean Asylum, Somerville, Mass., since 1879; Professor of Mental Diseases Dartmouth Med. School, since 1885; Clinical Instructor in Mental Disease, Harvard Medical School, since 1888.

A petition for a charter was at once made by this board, and granted by the Legislature Jan. 18, 1887.

The following is

THE ACT OF INCORPORATION.

CHAPTER 133.

COMMONWEALTH OF MASSACHUSETTS, IN THE YEAR
ONE THOUSAND EIGHT HUNDRED AND EIGHTY-
SEVEN. AN ACT TO INCORPORATE THE TRUSTEES
OF CLARK UNIVERSITY IN WORCESTER.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by authority of the same, as follows:

SECTION 1. Jonas G. Clark, Stephen Salisbury, Charles Devens, George F. Hoar, William W. Rice, Joseph Sargent, John D. Washburn, Frank P. Goulding and George Swan, all of the city of Worcester, in the Commonwealth of Massachusetts, and their successors, are hereby made a corporation by the name of the Trustees of Clark University, to be located in said Worcester, for the purpose of establishing and maintaining in said city of Worcester an institution for the promotion of education, and investigation in science, literature and art, to be called Clark University.

SECTION 2. Said corporation may receive and hold real or personal estate, by gift, grant, devise, bequest or otherwise, for the purpose aforesaid, and shall have all the rights, privileges, immunities and powers, including

the conferring of degrees, which similar incorporated institutions have in this Commonwealth.

SECTION 3. Said corporation shall have the power to organize said University in all its departments, to manage and control the same, to appoint its officers, who shall not be members of said corporation, and to fix their compensation and their tenure of office; and said corporation may provide for the appointment of an advisory board, and for election by the Alumni of said University to fill any vacancies in said board.

SECTION 4. The number of the members of said corporation shall not be less than seven nor more than nine, and any vacancy therein may be filled by the remaining members at a meeting duly called and notified therefore; and when any member thereof shall, by reason of infirmity or otherwise, become incapable, in the judgment of the remaining members, of discharging the duties of his office, or shall neglect or refuse to perform the same, he may be removed and another be elected to fill his place, by the remaining members, at a meeting duly called and notified for that purpose.

SECTION 5. This Act shall take effect upon its passage.

House of Representatives, March 30, 1887, Passed to be Enacted.

CHARLES J. NOYES, *Speaker*.

Senate, March 31, 1887, Passed to be Enacted.

HALSEY J. BOARDMAN, *President*.

During the previous five years, Mr. Clark had gradually acquired a tract of land comprising over eight

acres, located on Main Street, about a mile from the heart of the city, with additional tracts near by. This land has considerable elevation above that part of the city, is a watershed sloping to the south-east, ensuring sanitary excellence and a wide and picturesque view. A park reservation of about 25 acres, directly opposite, has been set apart by the city, and named University Park.

CENTRAL BUILDING.

Plans for a main building were submitted to the Board by Mr. Clark, which were approved, and its erection was at once begun. The corner-stone was laid with impressive ceremonies, Oct. 22, 1887. The building is plain, substantial and well appointed, 204x114 feet, four stories high and five in the centre, with superior facilities for heating, lighting and ventilation, and has been constructed of brick and granite, and finished throughout in oak.

The following year a Chemical Building was planned and erected.

The foundations of another department building are laid.

On April 3d, 1888, G. STANLEY HALL, then a professor at the Johns Hopkins University, was invited to the presidency. The official letter conveying this invitation contained the following well-considered and significant expression of the spirit animating the Trustees:

“They desire to impose on you no trammels; they have no friends for whom they wish to provide at the expense of the interests of the institution; no pet theories

to press upon you in derogation of your judgment; no sectarian tests to apply; no guarantees to require, save such as are implied by your acceptance of this trust. Their single desire is to fit men for the highest duties of life, and to that end, that this institution, in whatever branches of sound learning it may find itself engaged, may be a leader and a light.”

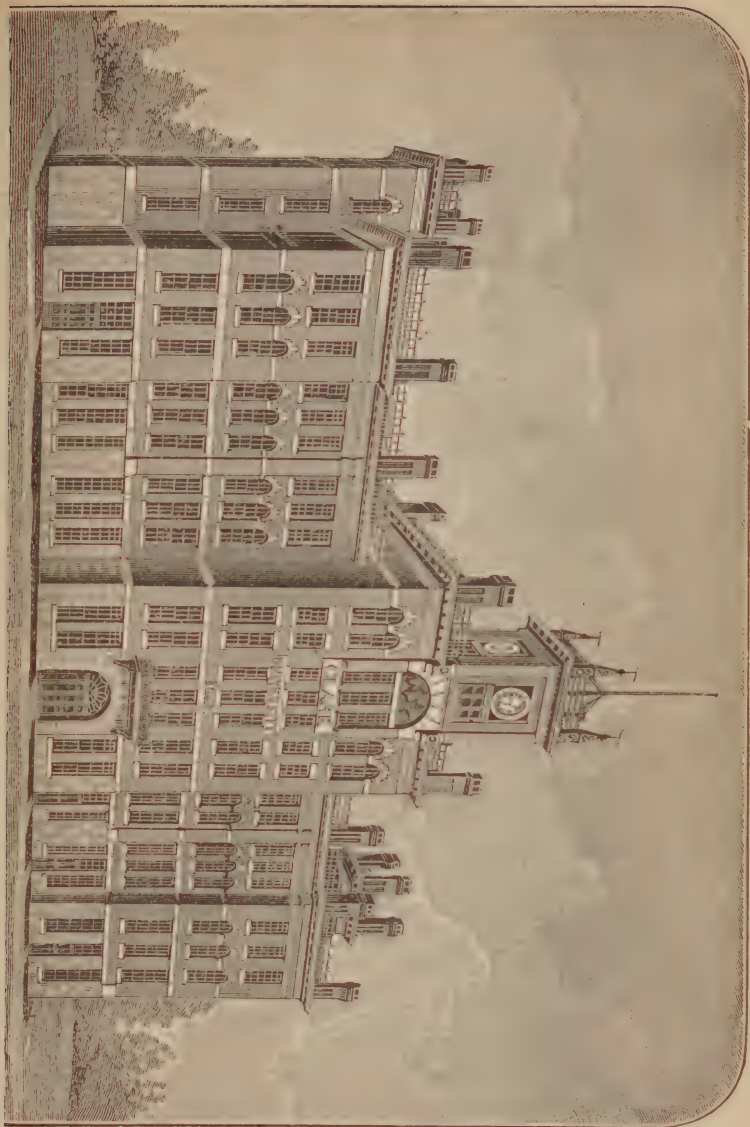
This invitation was accepted May 1st, and the President was at once granted one year's leave of absence, with full salary, to visit universities in Europe. This year was diligently improved in gathering educational literature and collecting information and advice from leading authorities, a report of which will probably be made later. Upon his return in April, 1889, it was unanimously voted to begin the University in five scientific departments, as follows: Mathematics, Physics, Chemistry, Biology and Psychology. It was also determined that the work of these departments should be, for the present, advanced or post-graduate work only.

In accordance with these provisions, instructors were engaged, announcements issued, apparatus and books ordered, and rooms equipped. Formal opening exercises were held on Oct. 22,* in the large hall of the University, and the work of instruction in these departments was at once begun.

DESCRIPTION OF BUILDINGS.

THE BUILDINGS are situated on a lawn of about eight acres with a frontage of 800 feet on Main street.

*The proceedings and addresses on this occasion are printed in a pamphlet entitled, “Opening Exercises of Clark University.”



The location is high and the building is placed on the most elevated point of ground and commands an extensive view over the city and the surrounding hills. The location of the buildings is shown in the following plan.



1. CENTRAL BUILDING. 2. CHEMICAL BUILDING.

The elevations of the Central Building and the floors of both are shown in the accompanying sketches.

CENTRAL BUILDING.

The plans of the first and central building of the University are the result of long observation and study and careful consultation with the leaders of education in both Europe and America. Its characteristic features are utility and solidity, and the aim has been to produce a model structure in all that relates to light, ventilation, sanitary arrangements, and acoustic properties.

The structure shows a general front of three stories high above the solid granite base of seventeen feet and the middle section has a fourth story which carries a clock tower. At each end is a projection in the shape of a tower rising one story above the

general level of the roof. The base story which at the front is entirely above the ground is laid up in bold rock faced granite, ashler capped with a cut granite water table belt. The main entrance is recessed under a granite archway 11 feet wide and 14 feet high. Over this is a granite balcony. Three special entrances to the right of the main entrance, one to the left leading into the gymnasium, and still another in the east end tower have been provided. The entrance from Woodland street is in all respects similar to that on the Main street side. Above the water table the building is constructed of Philadelphia pressed brick, with granite trimmings. Three large granite tablets on the central part of the front bear the inscription CLARK UNIVERSITY 1887.

The extreme length of the building is $204\frac{1}{2}$ feet, and its extreme width 114 feet. The height of the rooms are 17-16-14-12 feet in the clear.

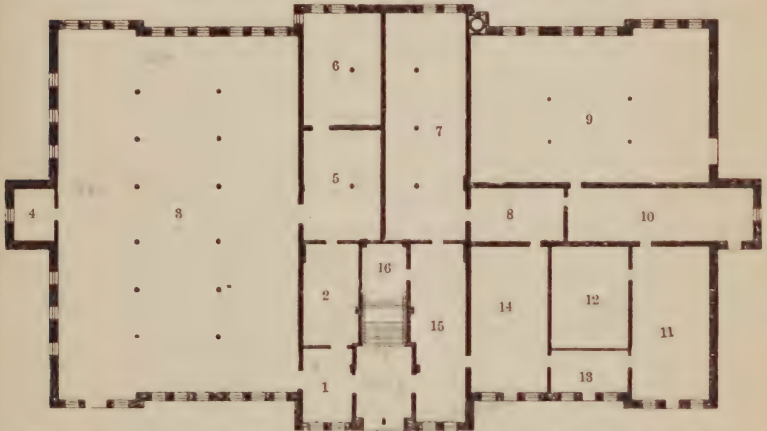
WALLS, FLOORS AND FINISH.

The outer walls are two feet thick, and are of brick laid hollow the plaster being laid directly on the brick with no outside furring. A large portion of the partitions are entirely of brick. The building has thus been constructed with a general view to fire resisting qualities although it is not claimed to be fire proof. There is a stand pipe at each end of the building with hose attached in the hall of each story. Where the partition walls are not of brick two independent partitions with an air chamber between divide the several lecture rooms for the purpose of deadening the sound, and are further improved by felting and asbestos linings. The same precautions have been taken with the floors, two thicknesses of deadening paper having been used in addition to the air spaces of 14 inches between the floors and the ceilings. The inner walls of the first floor are of pressed brick throughout the building. The doors, casings and wainscotings ($5\frac{1}{2}$ feet high throughout both the main halls and $3\frac{1}{2}$ feet in all the other rooms) are of Indiana white oak. All the floors are of rock maple and black birch. All water closets, bowls and basins above the first floor are located in the towers at either end of the

building. The plumbing throughout is of the best style of modern workmanship.

ROOMS.

In the south, the first floor is the gymnasium (No. 3). This room is 96 feet in length, 64 feet in width and 17 feet in height. It has a special entrance in the south-west corner and it also connects with the main entrance. Adjoining the gymnasium



Scale, one inch=about 53 feet.

Dimensions of Building, 204 x 114 feet.

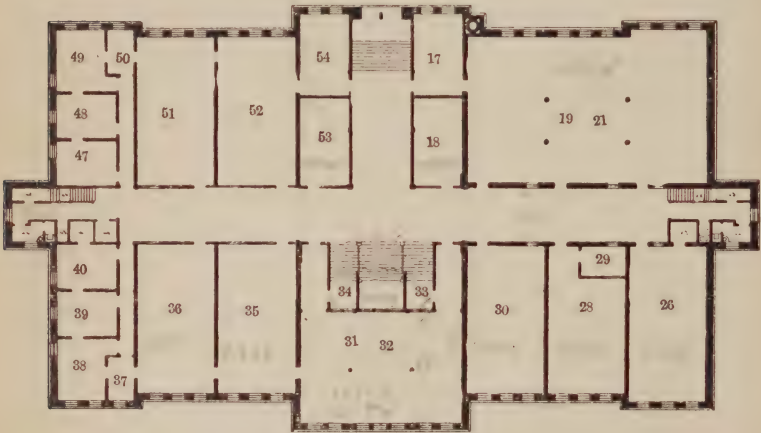
FIRST FLOOR.

are two large rooms (Nos. 5 and 6.) To the right of the main entrance are five connecting rooms (Nos. 11 to 15.) One of these (15) is fitted up as a machine shop and the other four are special research rooms of the Physics department. Back of these rooms are the boiler room, (No. 9) engine and dynamo room (No. 7), and a room for the storage battery cells (No. 8).

The Main street entrance opens into a vestibule 14 x 17 feet, from which the stairway, 12 feet wide, leads to the main corridors of the upper stories. Directly opposite the head of the stairs is a corridor leading to the Woodland street entrance. On either side of this corridor are two store rooms each 13 x 24 feet. (Nos. 18-53).

Running longitudinally through the middle of the building is a corridor 14 feet wide, terminating in the towers at either end, which have stairways leading to the several stories. In the central section of the Main street front is the library (Nos. 31 and 32) 32 x 44 feet, and adjoining it the reading room (No. 35) and the faculty room (No. 36), each of which are 21 x 40 feet.

In the southwest end of this floor are the rooms (Nos. 37 to 40)



SECOND FLOOR.

of the President, and the University Office. The Anthropological (Nos. 47-48), Psycho Physical (No. 51) and Neurological (No. 52) laboratories with their adjoining rooms for the instructors in these departments.

In the northeast are three rooms (Nos. 26-28-30), each 21 x 40, devoted to the purposes of the Physics department, one (No. 30) as a lecture room, the other two as private research rooms. There is also a large lecture hall (Nos. 19-21) 40 x 65 feet. The rooms on this floor are 14 feet high.

The third story is reached by a double flight of stairs, each section, 8 feet wide, leading to a landing 8 x 30 feet, and from this by a single flight, 12 feet wide, to the floor.

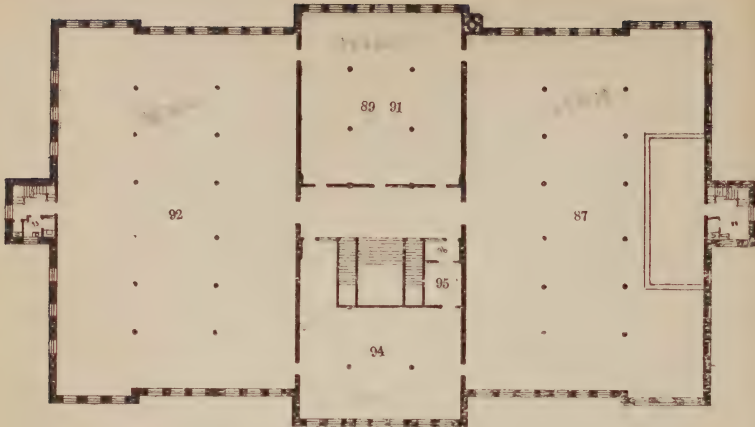
This floor has the longitudinal corridor as below, and eight private rooms (Nos. 59 to 62 and 67 to 70) for the instructors at the west end. It also contains the Mathematical (Nos. 57-58) and Biological (Nos. 71-72) lecture rooms, the Morphological (Nos. 73-74-75) and Anatomical (Nos. 76-77) laboratories, (each of



THIRD FLOOR.

which is 44 feet square), a large lecture room (Nos. 55-56) immediately over and corresponding in size to the library on the floor below, a room, (No. 78) 21 x 40, fitted up as a Meteorological laboratory and several other offices and rooms.

At each end of the fourth floor is a large lecture hall 65 x 100 feet and 16 feet in the clear (Nos. 87-92). The two rooms on the north and south of this floor are fitted up, that on the north (Nos. 89 to 91) for Animal Physiology and that on the south (Nos. 94 to 96) for Human Physiology. Each of these laboratories is 32 x 44 feet.



FOURTH FLOOR.



FIFTH FLOOR.

The central portion of the building is carried up another story and is reached by two flights of stairs leading into a hall or gal-

lery (Nos. 97-98) 44 x 80 feet and with a dome light 12 x 40. Adjoining this hall are two smaller rooms, from which a flight of stairs leads up to two large and well-lighted store-rooms.

HEATING.

The boiler-room, where the steam heating apparatus is located, is arched over with brick and iron girders, making the room absolutely fire proof. The low pressure gravity system is employed, and all pipes are graded away from the boilers, so that the condensed steam is carried by its own weight. The two large boilers are of 110 horse-power each. They are 6 x 17 feet in size, with 16 feet tubes, $3\frac{1}{2}$ inches in diameter. The boilers stand side by side, and are connected at the top by a drum. They are so arranged as to be run together or separately. The apparatus is divided into five systems, so that by means of valves in the distributing pipes heat can be cut off at the boilers from any given section of the building. Each system can be used separately or all can be run together, so that any one or more of the five sections of the building can be heated independently.

From the drum, which connects the two boilers, a 10-inch distributing pipe runs, and from this are two branch pipes, one eight inches and the other six inches in diameter. The six inch pipe supplies heat for the northerly end of the building, and the eight inch pipe, with its various branches, heats the central and southerly sections. From this pipe and at right angles with it are 6 inch branches running from the front to the rear, and then along the sides of the building. From it also extend $2\frac{1}{2}$ inch branches through the center of the building. At various points along these pipes risers run to the floors above, and from each riser steam is taken off for radiators on each floor. At the bottom of each riser and at every low point is a drip pipe connecting with the return pipes on the ground, which convey the water back to the boiler to be again converted into steam. This method of carrying off the water prevents the disagreeable snapping, common to steam apparatus, caused by the steam being forced against condensed water in the pipes.

A double system of heating has been adopted, running the pipes to every room, so that the chill can be taken off the building very

quickly. Thirty air chambers are placed on the first floor, where cold air is brought directly over the stacks, and fresh air is carried all over the building. No one of the air chambers connects with more than one room. The air, after entering the chambers, strikes perforated discs, through which it is distributed evenly through the radiators.

LIGHTING.

Following the models of such institutions both in this country and in Europe, every room in the building receives only a direct light. All cross lights are studiously avoided, the windows and seats all being arranged so that the light will be received at the back or the side of the students. The number, size and arrangement of the windows give an abundance of direct light to every room in the building.

There are in all about 250 windows with large paned and first quality German sheet glass and all are carried to the ceiling so that the greatest amount of light is obtained for the given surface of glass. The matter of obtaining a direct light has been accomplished without detriment to the general design of the building.

VENTILATION.

The fact that all the windows reach to the ceiling aids of course to secure good ventilation and there is besides a ventilating flue to every four feet of wall.

The entire first floor is ventilated by the flue, $2 \times 2\frac{1}{2}$ feet, which surrounds the steam chimney, and into which are openings on each floor.

The flat roofs are elevated about three feet above the ceilings, leaving an air space inside for the purpose of giving a draft of air to guard against variations of temperature. This space is ventilated by apparatus in the wall which can be opened or closed from the rooms below.

A summary statement of the size of the rooms may be made as follows:

The MAIN BUILDING contains

3 rooms 65x100 feet

1 " 44x80 "

2 " 40x65 "

2 " 44x44 "

3 " 31x32 "

14 " 21x40 "

and also six-five smaller rooms making a total of 90 rooms and 101 numbers.

CHEMICAL BUILDING.

The chemical building is constructed throughout of brick. The main body of the building has three stories, its south-western wing has two stories, each 22 feet in the clear. Its facilities for heating and ventilation are substantially the same as those of the main building. The outer walls are 2 feet in thickness, and the partition walls from 12 to 16 inches. All partitions are of brick, so that the building is nearly fire-proof. There are two main laboratories, 24 x 58, and 22 feet high.

FIRST FLOOR.

- | | |
|------------------|--------------------------|
| 17 Furnace Room. | 23 Crystallization Room. |
| 10 Boiler Room. | 16 Steam Room. |
| 3 Store Room. | 8 Coal. |



Dimensions of Building, 134' 8" x 135 feet. Scale, 1 inch = about 34.10 feet.

SECOND FLOOR.

- | | | | |
|-------|---|----|--|
| 26 | Lecture Room. | 28 | Balance Room. |
| 32-33 | Store Rooms. | 34 | Main Laboratory. |
| 35 | Combustion Room. | 39 | Crystallography—Private
Room of Dr. Williams. |
| 41 | Physical Chemistry Room—Private Room of Dr. Loeb. | | |
| 45 | Lecture Room. | | |

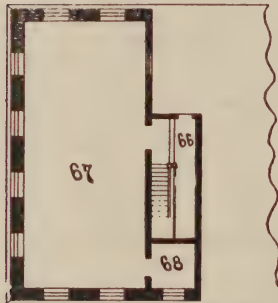


THIRD FLOOR.

47 Professor's Private Room. 51 Microscopy and Spectral Analysis—Private Room of Dr. Muthmann. 52 Dark Room.
54 Private Laboratory of Dr. Nef. 61 Chemical Library.



FOURTH FLOOR.



The CHEMICAL LABORATORY contains

2 rooms 24x58 feet		22 feet high	
4	" 22x47 "	14 to 16	" "
3	" 26x32 "	"	" "
3	" 20x32 "	"	" "
4	" 22x24 "	"	" "
3	" 18x32 "	"	" "
3	" 16x18 "	"	" "
12	" 14x16 "	"	" "

and others varying from 12x16 and 10x22 to 6x6, making a total of 68 rooms.

REGULATIONS.

ENACTED BY THE BOARD OF TRUSTEES APRIL 11TH,
1890.

1. All requisitions for apparatus and books must be made through the University office upon printed blanks provided for that purpose, and, except in the case of Docents, signed by a member of the staff.

2. So far as possible orders for only the kind and amount of apparatus certain to be used during the year shall be placed, nothing shall be ordered for future years, and apparatus for research shall take precedence over that for teaching and illustration only.

3. A book shall be kept for each department containing a complete list of apparatus and supplies with itemized cost. With the aid of this book a complete inventory of the stock shall be made once a year and whenever else the President shall direct.

4. Requistions for repairs, furniture, plumbing and work about the buildings, must be made in writing and with detail and must be approved by the Building or Finance Committee or such person or persons as they

may authorize. When once thus passed upon no change involving additional expense can be made in the requisitions without the consent of the Finance Committee.

5. No unappropriated rooms, and no part of the University grounds, shall be used for any purpose, and appropriated rooms shall not be used for other purposes than the stated University work for which they were intended, without previous permission from the office.

6. Unless for special reasons, absence of Instructors from their stated exercises or from town for two consecutive week days in term time, should be announced at the Office, and for longer absence permission should be obtained beforehand.

7. The Trustees desire that no Instructor, Docent or Fellow shall enter upon other engagements outside his proper work in the University of a kind or amount likely to lessen his full efficiency for science within the University.

PUBLICATIONS CONNECTED WITH THE UNIVERSITY.

I.—THE JOURNAL OF MORPHOLOGY.

This Journal was commenced in September, 1887, and is edited by Professor C. O. Whitman, with the co-operation of Edward Phelps Allis, Jr., of Milwaukee. From two to four numbers a year are issued, in crown octavo, of 150 to 200 pages each, with from five to ten lithographic plates. Vol. I (two numbers), \$6.00; Vol. II (three numbers), \$9.00; single numbers, \$3.50.

II.—THE AMERICAN JOURNAL OF PSYCHOLOGY.

This Journal was commenced in November, 1887, and is edited by Dr. G. Stanley Hall. Each volume contains four numbers of about 150 pages each. Besides original articles, about half its space is devoted to careful digests of the important literature in its field. Price, \$5.00 per volume; single numbers, \$1.50.

III.—The First Official Announcement was issued May 23d, 1889.

The Addresses and Exercises at the opening of the University on October 2d, 1889.

INDEX.

APPOINTMENTS.

	PAGE.
Staff,	3
Docents,	4
Honorary Fellows,	5
Fellows,	6
Assistants,	7
Scholars,	8

ADMINISTRATION.

Trustees,	9
President and Faculty,	10

GENERAL STATEMENTS, 12

Admission,	13
Classes of Appointees,	14
1-Docents,	15
2-Candidates for the Doctorate,	16
3 Special Students,	17
4 Medical Students,	18
5 Preliminary Candidates,	18

FELLOWSHIPS AND SCHOLARSHIPS, 19

Clark Fellowships, etc.,	20
Purpose of Fellowships,	21
Methods,	23
Library,	24
Notices,	25

DEPARTMENTS.

I—Mathematics,	27
II—Physics,	33
III—Chemistry,	39
IV—Biology,	46
V—Psychology,	64

HISTORY AND BUILDINGS, 75

Central Building,	81
Chemical Building,	89

PUBLICATIONS, 95

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Third Official Announcement.

APRIL, 1891.

TRUSTEES.

President,	-	-	JONAS G. CLARK.
Vice Presidents,	-		{ CHARLES DEVENS* GEORGE F. HOAR, WILLIAM W. RICE.
Secretary,	-	-	FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

	Jonas G. Clark,	
Stephen Salisbury,	John D. Washburn,	
Charles Devens*	Frank P. Goulding,	
George F. Hoar,	George Swan,	
William W. Rice,	Edward Cowles.	

COMMITTEES.

FINANCE.

Jonas G. Clark,
Stephen Salisbury,
John D. Washburn.

BUILDINGS.

Jonas G. Clark,
Stephen Salisbury.

BY-LAWS.

Jonas G. Clark,
William W. Rice,
John D. Washburn,
Stephen Salisbury,
George Swan.

James P. Hamilton, - - - Cashier.

*Died Jan. 7th, 1891.

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Third Official Announcement.

WORCESTER, MASS.:
PUBLISHED FOR THE UNIVERSITY.
April, 1891.

JOHN U. NEF, PH. D., Assistant Professor of Chemistry.

5 Grout Court.

A. B., with honors in Chemistry, Harvard, 1884; Kirkland Fellow, Harvard University, 1884-6; Ph. D., Munich, 1886; Professor of Chemistry and Director of the Chemical Laboratory Purdue University, Lafayette, Ind., 1887-9.

FRANKLIN P. MALL, M. D., Adjunct Professor of Anatomy.

5 Lagrange St.

M. D., University of Michigan, 1883; University of Heidelberg, 1884; University of Leipzig, 1885-6; Fellow, Instructor and Associate in Pathology, Johns Hopkins University, 1886-89.

OSKAR BOLZA, PH. D., Associate in Mathematics. 66 Florence St.

Ph. D., Göttingen, 1886; Reader in Mathematics, Johns Hopkins University, 1887-89.

EDMUND C. SANFORD, PH. D., Instructor in Psychology.

21 Oread Place.

A. B., University of California, 1883; Fellow of Johns Hopkins University, 1887; Ph. D., Johns Hopkins University, 1888; Instructor in Psychology, Johns Hopkins University, 1888.

DOCENTS.

GEORGE BAUR, PH. D., Docent in Comparative Osteology and Paleontology. 32 Maywood St.

Academy of Hohenheim, 1878-79; University of Munich, 1879-81; University of Leipzig, 1881-82; University of Munich, 1882; Ph. D., University of Munich, 1882; Assistant to Professor C. Kupffer, Munich, 1882-84; Assistant to Professor O. C. Marsh, Yale University, 1884-90.

FRANZ BOAS, PH. D., Docent in Anthropology. 210 Beacon St.

Ph. D., Kiel, 1881; Member of Expedition to the arctic regions 1883-4; Docent of University of Berlin, 1885. Anthropological Researches in British Columbia and Alaska, 1886-87; and in the same territory, under the auspices of the British Association for the Advancement of Science, 1888-89.

WILLIAM H. BURNHAM, PH. D., Docent in Pedagogy.

100 Chatham St.

A. B., Harvard University, 1882; Fellow Johns Hopkins University, 1885-86, and Instructor, 1888-89; Ph. D., 1888.

MORRIS LOEB, PH. D., Docent in Physical Chemistry.

9 Maywood St.

A. B., Harvard, 1883; Ph. D., Berlin, 1887; Assistant to Professor Wolcott Gibbs, 1888-89.

ARTHUR MACDONALD, A. B., A. M., Docent in Ethics.

77 Piedmont St.

A. B., University of Rochester, 1879; and A. M., 1883; Union Theological Seminary, 1880-83; Harvard University, 1883-85; Fellow of Johns Hopkins University, 1885; Berlin and Leipzig Universities, 1885-86; University of Paris, 1886-87; University of Zurich, 1887-88.

J. PLAYFAIR McMURRICH, M. A., PH. D., Docent in Morphology.

2 King St.

A. B., University of Toronto, 1879; and Assistant in Biological Laboratory, 1880-81; M. A., 1882; Professor of Biology in the Ontario Agricultural College, Guelph, Canada, 1882-84; Instructor in Osteology Johns Hopkins University, 1884-85; Ph. D.,

B. French

There were no beginners in this language.

1. The class read 'Siecle de Louis XIV' by Hettaine, about 150 pages, edition by Victor Leger (Hachette). Special attention was given to pronunciation.

2. Another class read 'La psychologie de l'attention', and 'Les methodes de la psychanalyse', with Mr. Ribot.

Besides the understanding of these works, a good pronunciation was aimed at.

Emile Liebl studied in Germany and Paris, especially languages and history. He gave his time and attention for the last 10 years ¹⁸⁷⁵ to Latin, Greek and the comparative grammar of Romance languages. He has many collections of valuable studies on these languages. Speaks French, German and Spanish fluently. Has had a great part in a textbook for German, also in one for French and English.

This memorandum was found attached to a letter, dated
10 May, 1893. Mrs. Paul Tappan of C. U., 1889-1891
See p. 16, ~~May~~ April 1891 "Register"

CLARK UNIVERSITY,

WORCESTER, MASS.

Work done during the year.

A. Gerund

1. In a 'lower' class - real beginners
there were none - we began with
Whitney's German Grammar and finished
the first part. We read 'Bilderbuch ohne
Bilder' by Andersen, 'Gernoldshausen' by
Fr. Gerstäcker, 'Höher als die Kirche' by
von Hillern. Exercises in conversation.

2. In a more advanced class we read
a part of 'Italienische Reise' by Goethe,
with a special view as to construction.

3. In scientific reading there were read
of 'Grundzüge der Physiologischen Psychologie'
by Wilhelm Wundt 300 pages in class and
the rest private. Special care was taken
to get at the exact meaning of scientific
terms which were treated critically as to
origin and use.

Johns Hopkins University, 1885; Professor of Biology at Haverford College, Pennsylvania, 1886-89; Member of Staff of Instruction, Marine Biological Laboratory, Woods Holl, Mass.

F. WILLIAM MUTHMANN, PH. D., Docent in Chemistry.

20 Grand St.

Assistant in Analytical Chemistry, University of Munich, 1884-86; Ph. D., Munich, 1886; Instructor in Chemistry and Crystallography, University of Munich, 1887-89.

JOSEPH DE PEROTT, Docent in Mathematics.

13 Woodland St.

Universities of Paris and Berlin, 1877-80.

CHARLES A. STRONG, PH. D., Docent in Philosophy.

9 Downing St.

A. B., University of Rochester, 1884; A. B., Harvard, 1885; Rochester Theological Seminary, 1885-86; Fellow of Harvard University, 1886; University of Berlin, 1886-87; Instructor in Philosophy, Cornell University, 1887-89; Universities of Paris, Berlin, and Freiburg (Baden), 1889-90.

HENRY TABER, PH. D., Docent in Mathematics.

2 King St.

A. B., Yale (Sheffield Scientific School) 1882; Ph. D., Johns Hopkins University, 1888; and Assistant in Mathematics, Johns Hopkins University, 1888-89.

ARTHUR G. WEBSTER, PH. D., Docent in Mathematical Physics.

3 Shepard St.

A. B., Harvard, 1885, with honors in Mathematics and Physics; Instructor in Mathematics, Harvard, 1885-86; Parker Fellow, 1886-89; Universities of Berlin, Paris, Stockholm, 1886-90; Ph. D., Berlin, 1890.

J. FRANCIS WILLIAMS, C. E., PH. D., Salem, N. Y., Docent in Chemistry. 70 Florence St.

St. Paul's School, Concord, N. H., 1880; C. E., Rensselaer Polytechnic Institute, 1883, and B. S., 1884; Ph. D., Göttingen, 1886; Student, Berlin, 1887; Director of Technical Museum of the Pratt Institute, Brooklyn, 1887-89.

ASSISTANTS.

JOHN C. CARDWELL, M. D., Brooklyn, N. Y., Assistant in Physiology. 1 Agawam St.

M. D., University City of New York, 1888; Assistant in Physiological Department of the Loomis Laboratory, New York City, 1888-89.

CLIFTON F. HODGE, PH. D., Ripon, Wis.

3 Lowell St.

A. B., Ripon College, 1882; Ph. D., Johns Hopkins University, 1889.

MASSUO IKUTA, PH. D., Assistant in Chemistry. 3 Ripley Place.

University of Tokyo, 1882-87; Ph. D., Erlangen University, 1888; Consulting Chemist, Tokyo, 1889-90.

V. PÄPCKE, PH. D., Assistant in Chemistry.

14 Crystal St.

Ph. D., Göttingen, 1888.

CAMILLE RIED, Boston, Mass., Instructor in Modern Languages.

84 Woodland St.

F. L. O. WADSWORTH, M. E., B. S., Cleveland, O., Assistant in Physics. 3 Cristy St.

E. M., State University, Columbus, O., 1887; M. E., 1888, and B. S., 1889.

S. WATÂSE, B. S., PH. D., Tokyo, Japan, Lecturer and Assistant in Morphology. 9 Shirley St.

B. S., Sapporo, Japan, 1884; Student of Zoölogy, University of Tokyo, 1884-86; Fellow, Johns Hopkins University, 1888-89, and Bruce Fellow, 1889-90; Ph. D., Johns Hopkins University, 1890.

HENRY S. WHITE, PH. D., Assistant in Mathematics. 6 Wyman St.

A. B., Wesleyan University, 1882; Assistant in Astronomy and Physics, Wesleyan University, 1882-83; Instructor in Mathematics at Hackettstown, N. J., 1883-84; Tutor in Mathematics, Wesleyan University, 1884-87; University of Göttingen, 1887-90; Ph. D., Göttingen, 1890.

HONORARY FELLOWS.

PURSUING SPECIAL INVESTIGATIONS.

WALTER CHANNING, M. D., Brookline, Boston, Mass.

THOMAS H. CLARK, B. S., Worcester, Mass., Honorary Fellow in Chemistry. 14 Lancaster St.

B. S., Polytechnic Institute, Worcester, Mass., 1880; Johns Hopkins University, 1883; Assistant in Chemistry, Wesleyan University, Middletown, Conn., 1886-89.

FELLOWS.

A. F. CHAMBERLAIN, A. B., Fellow in Anthropology. City Hotel.

University of Toronto, 1886; A. M., University of Toronto, 1889; Fellow in Modern Languages University College, Toronto, 1887-90; Examiner in German, University of Toronto, 1888-91; Examiner in Modern Languages, Trinity University, Toronto, 1890-91; Fellow of the American Association for the Advancement of Science.

CHARLES L. EDWARDS, PH. D., Fellow in Morphology. 14 King St.

B. S., Lombard. 1884; B. S., The Indiana University, 1886, and A. M., 1887; Johns Hopkins University, 1887-89; Ph. D., University of Leipzig, 1890.

EDWIN O. JORDAN, S. B., Auburndale, Mass., Fellow in Morphology. 70 Florence St.

S. B., Mass. Institute of Technology, 1888; Chief Assistant Biologist to the Mass. State Board of Health, 1888-90; Lecturer on Biology, Mass. Institute of Technology, 1889-90.

ALFRED T. DE LURY, B. A., Vancouver, B. C., Fellow in Mathematics. City Hotel.

B. A., Toronto University, 1890; Scholar and Medalist in Mathematics; Examiner in Mathematics, Toronto University.

W. H. METZLER, A. B., Odessa, Ont., Canada, Fellow in Mathematics. 87 Woodland St.

A. B., University of Toronto, 1888; Science Master, Collegiate Inst., Ingersoll, Ont., Canada, 1889.

SAMUEL P. MULLIKEN, S. B., PH. D., Fellow in Chemistry. 100 Chatham St.

S. B., Mass. Institute of Technology, 1887; Assistant in Chemistry, University of Cincinnati, 1887-88. Ph. D., University of Leipzig, 1890.

HERBERT NICHOLS, B. S., Fellow in Psychology. 70 Florence St.

B. S., Worcester Polytechnic Institute, 1871.

E. W. SCRIPTURE, PH. D., New York City, Fellow in Psychology.
978 Main St.

A. B., College of the City of New York, 1884, and A. M., 1890; Universities of Leipzig, Berlin and Zürich, 1888-90; Ph. D., Leipzig, 1890.

WILLIAM M. WHEELER, Milwaukee, Wis., Fellow in Morphology.
7 Shirley St.

German-American Normal College, Milwaukee, 1883; Ward's Nat. Sci. Estab., 1883-85; Teacher of German and Assistant in Biology, Milwaukee Public High School, 1885-88; Curator, Milwaukee Public Museum, 1887-90.

J. W. A. YOUNG, A. B., A. M., Williamsport, Pa., Fellow in Mathematics. 29 Benefit St.

A. B., Bucknell University, Lewisburg, Pa., 1887, and A. M., 1890; Instructor in Mathematics, Bucknell Academy, 1887-88; Student University of Berlin, 1888-89.

ERNEST ALBEE, A. B., Langdon, N. H., Fellow in Psychology.
1 Agawam St.

A. B., University of Vermont, 1887.

THOMAS F. HOLGATE, M. A., Foxboro, Ont., Canada, Fellow in Mathematics. 87 Woodland St.

B. A., Victoria University, Cobourg, Ont., 1884; M. A., 1889; Mathematical Master, Albert College, Belleville, Ont., 1884-90.

E. A. KIRKPATRICK, B. SC., M. PH., Ames, Iowa, Fellow in Psychology. 84 Woodland St.

B. Sc., Iowa Agricultural College, 1887, and M. Ph., 1889.

CHARLES WALKER, B. C. E., M. A., Knoxville, Tenn., Fellow in Chemistry. 4 Crown St.

B. C. E. and B. App. Ch., University of Tenn., 1885, and M. A., 1886; Assistant Professor of Chemistry and Physics, University of Tenn., 1886-88; Assistant in Chemistry, U. S. Naval Academy, Annapolis, Md., 1889-90.

GERALD M. WEST, A. M., PH. D., Fellow in Anthropology.
City Hotel.

A. B., Columbia College, 1888, A. M., 1889, and Ph. D., 1890.

SCHOLARS.

LOUIS W. AUSTIN, A. B., Winter Park, Florida. 5 Lagrange St.

A. B., Middlebury College, 1889; Student, University of Strassburg, 1889-90.

THADDEUS L. BOLTON, A. B., Scholar in Psychology.
16 Lagrange St.

A. B., University of Michigan, 1889; Principal Public Schools, Vulcan, Mich., 1889-90.

LEVI L. CONANT, A. M., Rapid City, South Dakota, Scholar in Mathematics. 58 Woodland St.

A. B., Dartmouth, 1879, and A. M., 1887; Principal High School, Mankato, Minn., and Elkhart, Ind., 1880-83; Superintendent of Schools, Deadwood and Rapid City, South Dakota, 1883-87; Professor of Mathematics, Dakota School of Mines, 1887-90; Member of American Association for the Advancement of Science.

T. PROCTOR HALL, M. A., Ph. D., Scholar in Physics. 15 Clifton St.

B. A., University of Toronto, 1882; Fellow of University College, Toronto, and Assistant in Chemical Laboratory, 1883 and 1884; Science Master, Woodstock College, Woodstock, Ontario, 1885-90; M. A., Ph. D., Illinois Wesleyan University, 1888; Fellow of the Chemical Society, England.

JAMES N. HART, B. C. E., Orono, Me., Scholar in Mathematics.
City Hotel.

B. C. E., Maine State College, 1885; Instructor in Mathematics and Drawing, Maine State College, since 1885.

JOHN J. HUTCHINSON, A. B., Auburn, Me., Scholar in Mathematics. 70 Florence St.

A. B., Bates College, 1889.

FRANK H. LOUD, A. B., Colorado Springs, Colo., Scholar in Mathematics. 84 Woodland St.

A. B., Amherst, 1873; Walker Instructor in Mathematics, Amherst College, 1873-76; Professor of Mathematics in Colorado College since 1877; Director of Colorado State Weather Service, 1889-90.

WILLIAM S. MILLER, M. D., Worcester, Mass., Scholar in Anatomy.
3 Castle St.

M. D., Yale Medical School, 1879; Lecturer in Microscopical Technique, Mount Holyoke College, 1887-88; Pathologist to the Worcester City Hospital, and Memorial Hospital.

GUSTAV RAVENÉ, A. B., Washington, D. C. 210 Beacon St.

A. B. Columbia College, Washington.

JEFFERSON R. POTTER, A. B., A. M. 10 Gates St.

A. B., Brown University, 1877, and A. M., 1887; Instructor, Vermont Academy, 1877-78; Eastern State Normal School, Castine, Me., 1878-85; Professor of Pedagogy, State College of Kentucky, 1885-88; Instructor in Natural Sciences, State Normal School, Farmington, Me., 1888-90.

J. F. REIGART, A. B., Salisbury, Md. 4 Crown St.

A. B., Dickinson College, 1888.

ALLISON W. SLOCUM, A. B., A. M., Scholar in Physics.
58 Woodland St.

A. B., Haverford College, 1888, and A. M., 1889; Resident Graduate in Physics, Haverford College, 1889-90.

MISCELLANEOUS.

LOUIS N. WILSON, 11 Shirley St.

J. ALLEN TAILBY, 80 Woodland St.

WALTER G. WATTS, 16 Woodbine St.

ADMINISTRATION.

The Trustees are the ultimate source of authority in all matters pertaining to the University. They act collectively, through the three committees named below, and also through the President of the University.

BOARD OF TRUSTEES.

JONAS G. CLARK,		
STEPHEN SALISBURY,		JOHN D. WASHBURN,
CHARLES DEVENS,*		FRANK P. GOULDING,
GEORGE F. HOAR,		GEORGE SWAN,
WILLIAM W. RICE,		EDWARD COWLES.

OFFICERS.

President,	- - -	JONAS G. CLARK.
Vice Presidents,	-	{ CHARLES DEVENS,*
		{ GEORGE F. HOAR,
		{ WILLIAM W. RICE.
Secretary,	- - -	FRANK P. GOULDING.

COMMITTEES.

Finance.

JONAS G. CLARK.	STEPHEN SALISBURY.
-----------------	--------------------

Buildings.

JONAS G. CLARK.	JOHN D. WASHBURN.
-----------------	-------------------

By-Laws.

JONAS G. CLARK,		
WILLIAM W. RICE,		STEPHEN SALISBURY,
JOHN D. WASHBURN,		GEORGE SWAN.

*Died Jan. 7, 1891.

PRESIDENT,

(G. Stanley Hall.)

The duties of this office were defined by the Trustees, May 23, 1889, as follows :

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University, and attend the meetings of the Board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

These duties were more fully defined by By-Laws enacted by the corporation, September 26, 1889.

FACULTY.

By action of the Trustees the Faculty Staff has been organized as follows :

I. UNIVERSITY SENATE.

Whose duty it is to elect Fellows and to take action upon general requirements for the Doctor's degree and other promotions, and to act and advise upon matters officially submitted to them.

II. GENERAL FACULTY.

Whose duty it is to consider all matters not otherwise provided for, and in which all departments of the University are alike interested.

III. THE BIOLOGICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Biology and Psychology.

IV. THE PHYSICAL-MATHEMATICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Physics, Chemistry and Mathematics.

V. THE LIBRARY COMMITTEE.

To be appointed by the President, the duty of which shall be to advise concerning the arrangement, cataloguing and use of books and other matters pertaining to the library not reserved to the Trustees or otherwise provided for.

GENERAL STATEMENTS.

The University now consists of a group of five closely related departments in which all its work and that of the above Instructors, Fellows, and Scholars is grouped. These departments are as follows :

- I. MATHEMATICS.
- II. PHYSICS, Experimental and Theoretical.
- III. CHEMISTRY, Organic, Inorganic, Physical, and Crystallography.
- IV. BIOLOGY, including Anatomy, Physiology and Paleontology.
- V. PSYCHOLOGY, including Neurology, Anthropology, Criminology, and History of Philosophy.

In addition to these modern languages are taught in a way to meet the practical needs of students in these departments.

To express more explicitly the character and policy of the institution, the Trustees have voted to approve and publish the following statement :

“As the work of the University increases, its settled policy shall be always, to first strengthen departments already established until they are as thorough, as advanced, as special, and as efficient as possible, before proceeding to the establishment of new ones.”

“When this is done and new departments are established, those shall always be chosen first which are scientifically most closely related to departments already established; that the body of sciences here represented may be kept vigorous and compact, and that the strength of the University may always rest, not upon the number of subjects, nor the breadth or length of its curriculum, but upon its thoroughness and its unity.”

“This shall in no wise hinder the establishment, by other donors than the founder, of other and more independent departments if approved by the Trustees.”

“While ability in teaching shall be held of great importance, the leading consideration in all engagements, reappointments and promotions shall be the quality and quantity of successful investigation.”

In focusing its means and care to make each of the above departments the best possible, the University now offers an extension of the elective system to institutions, believing that if this larger option should establish a habit of inter-university migration our higher institutions would be stimulated, and that thus they may be brought to represent the higher educational needs of the country.

ADMISSION.

Only graduate students are admitted, or those of equivalent attainments, unless in rare and special cases. At present no entrance examinations are required, but, by testimonials, diplomas, personal interviews or written specimens of work, the authorities must be satisfied that the applicant has scholarship enough to work to advantage, and zeal and ability enough to devote him-

self to his chosen field. The methods of the University are too costly, and its energy and funds too precious to be spent upon men who are not well trained, promising, and in earnest.

It is highly desirable, and will probably before long be required, that candidates entering any of the five departments should have, besides a knowledge of the other subjects commonly taught in colleges, a reading knowledge of French and German.

For the select students who are received, it is the purpose of the University to open all its privileges, and to supply every incentive possible in the way of books, facilities, and, above all, direct personal stimulus and instruction. The chief as well as the best work of this University is individual, and involves daily suggestion, encouragement and direction.

CLASSES OF APPOINTEES.

No clearly marked line exists between students and instructors. Fellows and scholars who have attained some degree of mastery in a special line of work give brief special courses, which are often attended by professors. This is a stimulus to the student, and both tests and exhibits his power in teaching. This, and the custom of instructors to attend each other's lectures, has added interest and efficiency to the work of the University during the year.

I. DOCENTS.

The highest annual appointment is that of Docent. These positions are primarily honors and are reserved for a few men whose work has already marked a distinct advance beyond the Doctorate and who wish to

engage in research. They are not assistants and their relations are directly with the President of the University.

Docents may be provided with individual rooms, and special apparatus may be purchased for their work if desired and approved. While they will be expected to deliver a limited number of lectures on some special chapter of their department, their time will be mainly reserved for study and research in a way best adapted to qualify them still more fully for academic advancement.

These positions are now official appointments. Appointees or others found worthy however, may be formally invested with the *licentia docendi*, the terms of which can now be furnished on application and which requires a memoir or essay representing original work in their own department, but no examination. This highest formal academic honor will be strictly reserved for those of marked scientific attainment and teaching ability and so far as this diploma can have the significance of a title or degree it will be regarded by the University as a brevet collegiate Professorship.

It is believed that by the existence of such a select body of men of guaranteed scientific training, ability and approved power to teach, the difficulties under which college trustees sometimes succumb in selecting suitable men for their professors may be diminished, and that otherwise this new grade will aid in raising standards of academic scholarship in colleges and in encouraging scientific research here.

Good men of this class are desired by the University above all others and may be paid a salary.

II. CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

In most cases it is probable that three or at least two years of graduate work will be necessary for this degree. Examinations for it, however, may be taken at any time when, in the judgment of the University authorities, the candidate is prepared. A pre-arranged period of serious work at the University itself is indispensable.

For this degree the first requirement is a thesis upon an approved subject to which it must be an original contribution of value. To this capital importance is attached. It must be reported on in writing by the chief instructor, printed at the expense of the candidate, and at least 100 copies given to the University. In case, however, of theses of very unusual length, or containing plates of unusual expensiveness, the academic senate shall have power, at the request of the candidate, to reduce this number of presentation copies to 50. Each of these copies shall bear upon it, in print, the statement of the chief instructor, that it is a thesis for the Doctor's degree in his department at Clark University.

Such formal or informal tests as the academic senate shall determine shall mark the acceptance of each Student or Fellow as a candidate for this degree.

One object of this preliminary test shall be to insure a good reading knowledge of French and German. Such formal candidature shall precede by not less than three months and not more than one year the examination itself, and the nature and result of this test shall be made matter of record.

The fee for the Doctor's degree is \$25 and in every

case it must be paid and the presentation copies of the thesis must be in the hands of the Librarian before the diploma is given. In exceptional cases, however, and by special action of the senate, the ceremony of promotion may precede the presentation of the printed copies of the thesis. The latter, however, must always precede the actual presentation of the diploma.

An oral, but not a written examination is required upon at least one minor subject in addition to the major, before an examination jury, composed of at least four members, including the head of the department and the President of the University, who is authorized to invite any person from within or without the University to be present and to ask questions. The jury shall report the results of the examination to the senate, who, if they are also satisfied, may recommend the candidate for the degree.

For the bestowal of this degree, the approbation of the Board of Trustees must in each case be obtained. They desire that the standard requirements for it be kept the highest practicable, that it be reserved for men of superior ability and attainment only, and that its value here be never suffered to depreciate.

It is to the needs of these students that the lectures, seminaries, laboratories, collections of books, apparatus, etc., are specially shaped and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the Fellowships and Scholarships are primarily intended, although any of these honors may be awarded to others.

III. SPECIAL STUDENTS NOT CANDIDATES FOR A DEGREE.

Any one desiring to undertake a special and approved

line of research and whose attainments are such as to satisfy the requirements of the University may also be received. This class includes those who may desire to devote themselves exclusively to one or more of the special branches — mathematics, physics, chemistry, biology or psychology — but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects) may be allowed entire freedom in their choice and combination of studies, and as special students, may enjoy all the privileges of the University.

These students may, with the approval of the President, be received for less than an entire year.

IV. MEDICAL STUDENTS.

The University offers special facilities in those fundamental disciplines upon which the study of medicine in all its departments now rests.

Students of sufficient preliminary training can be admitted in the departments of chemistry, biology, anatomy, physiology, neurology and anthropology, and receive here the purely scientific part of a medical education. For such students work in the above departments can be now so arranged as to be almost identical with that of the first two years of the best medical schools of the world. Facilities for clinical instruction and hospital work which commonly constitute the latter part of a medical course, are not yet offered here.

V. PRELIMINARY CANDIDATES.

Non-university students of less special, or less ad-

vanced standing than the above four classes, who are nearly, but not quite, qualified to become candidates for the degree of Doctor of Philosophy, may also be received.

Students of this class must for the present have completed the work of the first three years of a regular under-graduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University of their attainments and that they contemplate advancing to a degree higher than that of A. B. The privileges and status of these students will be more fully defined later. They may in exceptional cases be elected to Scholarships.

FELLOWSHIPS AND SCHOLARSHIPS.

To no form of educational gift or bequest have probably so many people contributed as to the various forms of individual aid to meritorious students.

Under the names of bursaries, stipends, exhibitions, prizes, benefices, etc., as well as of scholarships and fellowships, the revenues of foundations established by and bearing the names of sometimes thousands of donors, are annually distributed.

Sometimes these funds were given by men or women themselves not far removed from need, and are appointed to furnish a student with firewood, a room, a bed, one daily meal, or a coat each year, etc., and sometimes yield one or two thousand dollars to a single holder. Often many students were provided by a single donor, and some of these European foundations, even the smallest, are centuries old, so sacredly are they guarded and they were never so rapidly increasing as now.

The more advanced the education the more such aids are needed, and the more numerous and substantial do they in fact become in Europe.

So great is now the need of bringing the best intellects to fullest maturity, and so increasingly necessary for the highest scientific attainment are now the leisure, tranquility, books and apparatus thus best supplied, that the demand is strong for still more and greater aids of this kind for advanced and competent students.

Several of the wisest governments in Europe, recognizing that the modern world and its rulers are ruled by experts thus best trained, vie with private munificence in supplying such aids.

THE CLARK FELLOWSHIPS AND SCHOLARSHIPS.

With a deep sense of the peculiar needs of our country in this respect, the founder of this University and his wife have provided such opportunity and incentive here for thirty meritorious students which will be available for the next academic year as follows :

10 Fellowships of \$600 per year.

10 Fellowships of \$400 per year.

10 Scholarships of \$200 per year.

In general these appointments may perhaps represent the successive stages of approximation to the Doctor's degree, the highest priced Fellowships being for men within a year of that degree, the next for those within two years of it. Those who have already taken the Doctor's degree or those not intending to do so may be appointed to Fellowships and Scholarships. The tuition fee which is included in the above sums will be deducted.

The founder of the University and his wife unite

with the Trustees and President in inviting sympathy and practical co-operation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

A CITIZEN'S FUND.

In addition to this a citizen of Worcester has given a fund of \$5000, the income of which is to be used for the aid of "some one or more worthy native born citizens of the city of Worcester who may desire to avail themselves of the advantages of the institution."

THE FIELD FUND.

Mrs. Eliza W. Field has also given \$500, to be called the "John White Field Fund," the income of which is "to provide for the minor needs of a Scholar or Fellow."

PURPOSE AND CONDITIONS OF FELLOWSHIPS.

Fellowships at Clark University are intended for young men of promise who desire to pursue post-graduate studies in order to fit themselves for intellectual careers. It is desirable, but not required, that candidates for these positions should intend to proceed to the degree of Doctor of Philosophy or to equivalent attainments. In general, those intending to represent some special branch of learning are preferred to those directly fitting themselves for one of the three learned professions, although the latter are not excluded.

Applications should state the candidate's course of study and be accompanied by testimonials or diplomas, should indicate a decided preference for some special department and if possible be accompanied by some specimen of his work for the aid of the Board of Selec-

tion. Applications will be considered in June and in October and should be in the hands of the President on or before the first of these months. In special cases vacancies may be filled by appointments at any time during the year. The names of unsuccessful candidates will not be made public.

Fellows must reside in Worcester during the academic year and devote themselves to special studies under the direction of their instructors and give such evidence of progress or proficiency before the end of the year as the authorities shall require. They must cooperate in promoting order and the ends of the University, must not teach elsewhere and may be reappointed at the end of the year. Because intended primarily as honors, both Fellowships and Scholarships are awarded without reference to pecuniary needs, so that those able and desiring to do so may relinquish the emolument and retain the title of "Scholar" or "Fellow."

Both Scholarships and Fellowships are open only to students in one or more of the five departments announced.

METHODS.

Beside field work, excursions to institutions public and private, coaching and cram-classes, clubs, examinations, conferences and other modes by which knowledge now seems best imparted and retained, the following educational methods will be prominent :

LECTURES. The Trustees desire that each instructor of however few students, should prepare and deliver regular lectures, with diagrams, illustrative apparatus and references to standard text books, and the best current literature upon each topic. Advanced students

and instructors will also be encouraged to supplement the work of the professors by giving occasional special lectures and courses. Public lectures will from time to time be given.

SEMINARIES. These are stated, perhaps weekly, meetings, often in a department library, for joint, systematic, but conversational work, under the personal direction of the professor, in some special chapter of his subject. Here the results of individual reading are reported for the benefit of all; views are freely criticised; new inquiries, methods, comparisons, standpoints, etc., suggested. From the mutual stimulus thus given many important works have proceeded, and the efficiency of universities, especially in Germany where seminars were first generally introduced, has been greatly increased.

LABORATORY WORK. For beginners this was from the first the best of all forms of apprenticeship, bringing student and professor to a far closer and mutually stimulating relation. Here the manipulation of apparatus is learned, each well-chosen piece of which is an obvious epitome of long lines of research; processes are criticised, results obtained by other investigators are tested, methods discussed and perfected. The modern laboratory has thus become an unexcelled school of logical mental discipline from which is developed as its best product, that rare independence in research which is the consummation of scientific culture.

NOTICES.

The charge for tuition, giving all the privileges of the University, but not covering laboratory fees is \$200 per annum; but special arrangements may be

made with individuals who are not under appointment as Scholars or Fellows.

The fee for students of the educational department alone is \$50, with \$10 additional for the work of each additional instructor.

Board and lodging can be obtained near the University at very moderate rates.

Further announcements will be made from time to time during the summer.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk of the University, Worcester, Mass.

DEPARTMENTS.

The statements of the instructors concerning the courses given during the academic year 1890-91, which follow, are supplemented by announcements of the work to be done during the academic year 1891-92, so far as can be done at the date of issue. These announcements can now be complete only in case of Professors and Assistant Professors. Further announcements for Docents as well as the work for new Instructors who may be appointed before the beginning of the next academic year will be made later. Standard courses will be repeated in successive years.

I.

MATHEMATICS.

WORK OF THE PAST YEAR.

During the current year instruction has been given in this department by

WILLIAM E. STORY, PH. D., Professor of Mathematics.

OSKAR BOLZA, PH. D., Associate in Mathematics.

JOSEPH DE PEROTT, Lecturer on Mathematics.

HENRY S. WHITE, PH. D., Assistant in Mathematics.

HENRY TABER, PH. D., Docent in Mathematics.

PROFESSOR STORY

Has lectured on the following subjects :

I.—NONEUCLIDEAN GEOMETRY AND HYPERSPACE; general notions of space, loci, principles of measurement, perpendicular and parallel elements, circles, spheres and hyperspheres, flatness and curvature, cylinders, cones and conoids, ruled and hyperruled loci, trigonometry, with applications to euclidean and threefold space.

II.—MODERN HIGHER ALGEBRA; differentiants, their number and the corresponding generating functions, ground-differentiants, applications to invariants and covariants; orders of restricted equations.

III.—CALCULUS OF FINITE DIFFERENCES; symbolic methods, direct and inverse processes, connection with the infinitesimal calculus, interpolation, finite summation, approximate integration, difference equations, functional equations.

IV.—PROBABILITIES; averages, probabilities and odds, independent and dependent events, alternatives, permutations and combinations, conditioned events, determination of probabilities by finite differences, continuous probabilities, mathematical and moral expectations, method of least squares, mortality.

Professor Story also conducted a MATHEMATICAL SEMINARY, in which lines of investigation were suggested in connection with the lectures on noneuclidean geometry, and types of surfaces and curves were discussed and illustrated by models; this discussion embraced all the more salient characteristics of the surfaces and curves represented

by the models in the University's collection. Individual students have been directed in the investigation of special topics.

DR. BOLZA

Has lectured on the following subjects :

I.—ELLIPTIC FUNCTIONS (introductory course); elements of the theory according to Legendre, Abel, Jacobi, with applications to geometry and mechanics.

II.—THEORY OF FUNCTIONS (introductory course); real functions of real variables, definite integrals, Fourier's series, extension of algebraic operations to complex quantities, monogenic functions, orthomorphic transformation, definite integrals between complex limits according to Cauchy.

III. THEORY OF SUBSTITUTIONS AND ITS APPLICATIONS TO ALGEBRAIC EQUATIONS; asymmetric functions and substitution—groups, algebraic relations between different asymmetric functions, Galois' theory of the solution by radicals of algebraic equations, groups of operations in general.

IV.—WEIERSTRASS' THEORY OF ELLIPTIC FUNCTIONS; uniform functions in general, σ , Liouville's theorems, the function \wp .

MR. DE PEROTT

Has been lecturing on the most elementary parts of the theory of numbers twice a week throughout the year :

Historical sketch, greatest common divisor, uniqueness of the decomposition of a number into prime factors, continued fractions, Nicholas Chuquet's process, Felkel's method of decomposition into prime factors, definition of congruences, congruences of the first degree, quadratic residues, pure (or binomial) congruences, first of Gauss' methods of decomposition of a number into prime factors, decimal fractions, quadratic forms for negative and positive determinants, second method of Gauss for the decomposition of a number into prime factors, composition of forms, a sketch of Kummer's theory of ideals.

DR. WHITE

Has lectured on the following subjects :

I.—HIGHER ALGEBRA (introductory course); symmetric functions of the roots of an equation, resultant of a system of equation, discriminants, linear transformation of binary quantics as equivalent to a central projection of a line, invariant relation a projective property, resulting general type of invariants of a binary quartic, covariants, symbolic notation of Aronhold-Clebsch, evectants and transvectants, derivation of form-series and form-system of a binary quantic by transvection.

II.—HIGHER PLANE CURVES (introductory course); homogeneous point and line coordinates, contragredience, elementary invariants of ternary quantics, geometrical interpretation, transition from binary to

ternary contravariants, reciprocal and projective figures, singularities of a curve, Pluecker's equations, poles and polars, Hessian, Steinerian, and Cayleyan concomitant curves, quadric transformation and the general Cremona transformation.

III.—PLAIN CUBICS AND QUARTICS; the nine inflections of a cubic, their grouping and reality, canonical form of equation, configuration of harmonic polars, the three systems of conjugate points, methods of Chasles, Schroeter, and Grassmann for generating a cubic, integrals upon the curve, reduction to Weirstrass' normal form, parametric expression of the coordinates, application of Abel's theorem to a group of conjugate points and to the problem of tangent conics; canonical form of the equation of a quartic, the double tangents, grouping in pairs and triplets, the 63 systems of tangent conics and cubics discussed algebraically.

IV.—ABELIAN INTEGRALS; the curve-throng as an auxiliary, homogeneous notation in differentials, the covariant differential form, three species of elementary integrals, new aspect of the deficiency of a curve, normal integrals, relation of a curve to a Riemann's surface, periods and period-relations of normal integrals, enumeration of algebraic functions having given poles on the curve, abelian theorem applied to the theory of conics, etc., tangent to a quartic.

V.—ALGEBRAIC SURFACES AND TWISTED CURVES (introductory course); homogeneous coordinates of point, line, and plane, reciprocal figures, singularities of surfaces and curves, classification of curves, discriminants and tact-invariants.

VI.—MODERN SYNTHETIC GEOMETRY (introductory course); projectivity of sheaves of elements, involutions of the second order, derived forms, conics, cones, quadric surfaces, twisted cubics and quartics.

DR. TABER

Has lectured on the following subjects :

I.—QUATERNIONS (introductory course); geometric addition, product and quotient of vectors, quaternions, transformation of quaternion expressions, differentiation, linear vector functions and matrices, solution of linear equations, applications, applications to the geometry of the straight line and plane, the sphere and surfaces of the second order, imaginary quaternions.

II.—MULTIPLE ALGEBRA; Peirce's theory of linear associative algebra, Clifford's system of geometric algebras and their relation to the "Ausdehnungslehre" (with applications), the theory of matrices (including the substance of Cayley's memoir, various papers by Sylvester, Buchheim, Weyr, etc., together with investigations by the lecturer, which will shortly appear in the *American Journal of Mathematics*).

III.—LOGIC (a); *Symbolic Logic*; relation of the traditional system to symbolic logic, De Morgan's additions, the Boolean calculus, Mitchell's system, the sixteen possible algebras with one universal and one particular copula, logic of relatives, Pierce's modification of Mitchell's

method, categories of reasoning, philosophy of notation, different kinds of signs (icons, tokens, indices), characteristics of a complete system of notation. (b) *Theory of Induction*; inverse application of the theory of probability, Mill's theory of induction, C. S. Peirce's theory.

There have been, throughout the year, weekly conferences of the instructors and students, at which abstracts of mathematical papers of peculiar interest, together with the results of some original investigations by members of the department, have been presented and discussed. One of the most useful features of these conferences has been the presentation by different persons of various methods of accomplishing the same result, the comparison of which has led to the discovery of still other methods and other applications of these methods.

WORK OF THE NEXT YEAR.

During the year 1891-92 lectures will be given on the following subjects, among others :

History of Mathematics.
Theory of Numbers,
Finite Differences and Interpolation,
Probabilities and the Method of Least Squares,
Modern Higher Algebra,
Substitutions and Algebraic Equations,
Differential Equations,
Definite Integrals,
Calculus of Variations,
Theory of Functions of a Complex Variable,
Elliptic Functions,
Higher Plane Curves (analytic theory),
Analytic Geometry of Three Dimensions,
Modern Synthetic Geometry,
Quaternions.

There will be at least one Seminary meeting weekly, in which topics for investigation will be suggested; individual students will be guided in the study of special subjects, with a view to independent research, or will be associated with the several instructors in their investigations; and weekly Conferences will furnish an opportunity for the presentation and discussion of various subjects and methods that may be suggested from time to time.

During the current year PROFESSOR STORY has continued his investigations in Noneuclidean Geometry and Hyperspace, and has also made some researches in the theory of Restricted Equations.

DR. WHITE, who began his work since the last Register was published, is the author of

Ueber zwei covariante Formen aus der Theorie der Abel'schen Integrale auf vollständigen, singularitätenfreien Schnittcurven zweier Flächen (Math. Annalen, Vol. 36, 1890).

Abel'sche Integrale auf singularitätenfreien, einfach überdeckten, vollständigen Schnittcurven eines beliebig ausgedehnten Raumes (Nova Acta der Ksl. Leop.-Carol. deutschen Akademie der Naturforscher, Vol. 57, 1891).—and is now studying the theory of combinants, in the hope of perfecting and extending the results published in these essays.

MR. JOSEPH DE PEROTT intends to give a course of lectures on the theory of numbers exactly similar to that given during the past year, with such improvements, however, as the advance of the science or the experience of the last year may suggest.

M. Joseph de Perott, who began his work since the last Register was published is the author of the following papers:

Sur la sommation des nombres 1. Bulletin des sciences Mathématiques, 2me série vol. 5 p. 37-40. 1881.

Sur l'infinité de la suite des nombres premiers. Ibid. p. 183-184. 1881.

Sur une arithmétique espagnole du 16me siècle. Bulletino di bibliografia e di storia delle scienze matematiche, vol. 15 p. 163-170. 1882.

Sur la recherche des diviseurs des fonctions entières. Bulletin de la Société Mathématique, vol. 10 p. 250-251. 1882.

Sur un théorème de Gauss. Ibid. p. 87-88. 1882.

Sur la formation des déterminants irréguliers, Journal für Mathematik, vol. 95 p. 232-237. 1883.

Sur le problème des fous. Bulletin de la Société Mathématique, vol. 11 p. 173-186. 1883.

Sur la formation des déterminants irréguliers. Second Mémoire. Journal für Mathematik, vol. 96 p. 327-348. 1884.

Démonstration du théorème fondamental de l'algèbre. Journal für Mathematik, vol. 99 p. 141-160. 1885.

Démonstration de l'existence des racines primitives pour les modules égaux à des puissances de nombre premier impair. Bulletin des sciences mathématiques, 2me série, vol. 9 p. 21-24. 1885.

Sur les logarithmes à un grand nombre de décimales et en particulier sur les Tables de Steinhauser. Bulletin des Sciences Mathématiques, 2me série, vol. 11 p. 51-60. 1887.

Sur l'équation $t^2 - Du^2 = -1$. Journal für Mathematik, vol. 102 p. 185-223. 1888.

Remarque au sujet du théorème d'Euclide sur l'infinité du nombre des nombres premiers. American Journal, vol. 11 p. 99-138 and vol. 13 p. 235-308. 1888 and 1891.

Sur une proposition empirique énoncée au Bulletin. Bulletin de la Société Mathématique, vol. 17 p. 155-156. 1889.

On a theorem of Gauss. Johns Hopkins University Circular. No. 78, p. 30. 1889.

FACILITIES.

The facilities to be found here for the study of mathematics in its

various branches are unexcelled in this country. The library is provided with complete sets of all the more important current mathematical periodicals and the publications of the scientific societies of the world, with the standard treatises on the subjects now particularly engaging the attention of mathematicians, the collected works of the great mathematicians, and many books illustrating and discussing the history of mathematics; to which will be added from time to time such other works as may be needed or appear desirable. The department is also equipped with full sets of Brill's admirable models of mathematical surfaces and Björling's thread models of developable surfaces.

Personal guidance will be given each year, as far as possible, to advance students desirous of pursuing the study of subjects in which courses of instruction are not specially announced.

II.

PHYSICS.

WORK OF THE PAST YEAR.

Instruction has been given in this department during the current year by

A. A. MICHELSON, PH. D., Professor of Physics.

A. G. WEBSTER, PH. D., Docent in Mathematical Physics.

PROFESSOR MICHELSON

Has given the following courses of Lectures :

(1). INTERFERENCE AND DIFFRACTION.

(2). VELOCITY OF LIGHT.

In the first course the mathematical theory of diffraction was developed, and especial attention was given to its bearing on the theory of the telescope, microscope and spectroscope. The application of the theory to the explanation of the blue color of the sky, the hues of sunset sky and clouds, and the rainbow were also treated.

The subject of "visibility curves" and their principal applications was treated at considerable length, both theoretically and experimentally. These applications include, first, the measurement of minute angles such as are subtended by small or distant planets, satellites or double stars; second, the determination of the character and composition of the approximately homogeneous light which produces the spectral lines of the elements.

The theoretical part of the work on the "application of interference methods to spectroscopic measurements" forms the subject matter of a paper to be published in the coming (April) number of the *Philosophical Magazine*.

The experimental part of the work, the success of which is largely due to the able assistance of Mr. F. L. O. WADSWORTH, is still in progress. Briefly the results may be summed up as follows :

The radiations which, when examined by the most powerful spectroscopic appliances known, yield nothing but a simple spectral line, are not only clearly shown to be double, triple or quadruple, but the distance between the components, often less than a hundredth of the distance between the two sodium lines, are readily and accurately measured, and even the distribution of intensity of light in the components themselves may be inferred.

The importance of so powerful an appliance for the analysis of radiations will be readily understood, and it may be confidently expected that by its means many new problems, which would otherwise have been well nigh hopeless, will be brought within the domain of experimental research./

The results of these experiments showed that among the twelve radiations thus far examined not one was "single." This result is in itself of sufficient importance to warrant a preliminary study at once, especially as it shows the necessity for a systematic search for a "single" radiation before proceeding further with the work of making a light wave the ultimate standard of length, or if (as appears possible) such is not to be found, to make a careful study of the doubles which may be suitable for the purpose.

In the second course of lectures an historical summary of the various attempts to measure the velocity of light was given, and several of the more recent determinations, including Prof. Michelson's own work, the bearing of the results on the undulatory theory of light, on the determination of the sun's distance and on the effect of the motion of the medium through which the light is passing, were discussed in detail.

DR. WEBSTER

Has lectured once a week throughout the year on the mathematical theory of Electricity and Magnetism, the course being designed to form a part of an extended course on the methods of Mathematical Physics. The lectures began with a treatment of the principles of Dynamics, leading from the statement of the Laws of Motion to the discussion of the subject of Energy, Conservative Systems, and the theory of Attractions. Forces acting according to the Newtonian law were then taken up, and a full development of the properties of the Potential Function was given.

This was followed by the application to Electrostatics and Magnetism, and the course will also include Electrokinematics and Electrodynamics. An attempt has been made to show the generality of the mathematical processes used, and to point out applications to the theory of the Flow of Heat, Hydrodynamics, etc.

A course on the theory of Elasticity and Hydrodynamics has been announced.

EXPERIMENTAL WORK.

DR. WEBSTER has been engaged on electrical measurements with a view to a determination of the ratio between the two systems of electrical units, according to the method described in his Berlin dissertation. The value of this quantity is a cardinal point in electrical theory, inasmuch as it is identical with the velocity of transmission of an electromagnetic disturbance in free space, and according to theory is equal to the velocity of light.

The method proposed makes the electrical measurement depend upon a measurement of length, time, and electrical resistance. The experimental work thus far has had to do with the accurate comparisons of resistances, and the gradual passage from a standard unit to working resistances of several million of units, careful provision necessarily being made for keeping the temperature of all the resistances constant during the observations. For the measurement of the minute intervals of time required a new form of drop-chronograph which shall measure the interval between the time of breaking two electrical circuits has been devised, and is now being constructed. It is hoped that this instrument will be considerably more accurate than the Helmholtz Pendulum-inter-ruptor, which it is intended to replace.

Considerable time was devoted to practice in the manufacture and manipulation of quartz fibres, with which various measuring instruments have been furnished, in particular, the electrometer to be used in this determination has had its directing moment given by such a fibre, with great advantage as to constancy of its indications.

DR. T. P. HALL has been investigating during the year two complementary methods of determining the surface tension of liquids, each of which was found capable of an accuracy of one-tenth of one per cent. One of these involves the "contact angle," the other does not. These methods have been employed in finding the values of the angle of contact of various liquids with platinum and glass, and in finding the effect of minute quantities of dissolved substances upon the surface tension of the solvent.

MR. AUSTIN has been engaged in an investigation on the application of the interference method to the measurement of small angular displacements of swinging needles with the view of producing a galvanometer capable of measuring much smaller currents than is possible with those at present used. The whole has been carried far enough so that a sensitiveness certainly ten times and probably fifty times greater than that of the best instruments now in use is assured.

WORK FOR NEXT YEAR.

PROFESSOR MICHELSON.

During the coming year the theoretical work will consist of a course of lectures for students in Physics, and a minor course for others. The former will be a continuation of the present course of lectures on the Undulatory Theory of Light, and will embrace the subjects of Polarization and Double Refraction which will be fully treated from the theoretical standpoint, and also in its relation to their applications to photometers, heliometers and polaristobometers.

Professor Michelson intends to include a detailed account of the results of his own investigations on the velocity of light in air and in liquid media; on the effect of the motion of the medium on the velocity of light, and its bearing on the problem of the motion of the solar sys-

tem through space; on the application of interference methods to precise measurements, including micrometrical, telescopic and spectroscopic. The course will conclude with an account of the recent progress in the investigation of the relations between light, electricity and magnetism.

The work of experimental research is to be devoted to the problem of defining the length of the standard meter in terms of a light wave; to ascertaining the relative length of a few light waves with the utmost attainable precision; and to the application of interference methods to spectroscopic measurements.

Besides this, especial attention will be given to the general problem of the practical application of interference methods to measurements of length and angles. As instances of the class of problems falling under this head, in addition to those already referred to may be mentioned the following: replacement of mirrors in galvanometers, electrometers, and all other instruments in which the method of mirror and scale is employed, by refractometers; measurement of co-efficients of elasticity and of expansion; measurement of index of refraction of solids, liquids and gases.

For the first-named work, a very accurate and well constructed instrument (by J. A. Brashear) is to be employed in connection with the large interferential comparer which was originally employed in this work. It is hoped that by this means it will be possible to define the unit of length in terms of the unalterable length of some standard radiation, and to reproduce this standard (or a large multiple of it) with a degree of accuracy exceeding that now attainable, even in copying one standard from another.

FACILITIES.

The following rooms have been assigned for the use of the Physical Department:

On the lower floor, or basement, are three rooms to be used for experiments requiring great steadiness and freedom from vibration. The end-room is designed for magnetic and electrical work. It has been deemed advisable to omit from it the piers and other fittings which it is to have ultimately, so that they may be appropriately fixed for special work. At present this room is used by Mr. Wadsworth.

The second room has been provided with solid piers and with a partition which provides steadiness and uniform temperature. The experiments on measurements of wave-lengths, and any similar work, are to be conducted in this room. Between the partition and the windows are two piers for spectroscopic work.

The third room is also designed for delicate experiments requiring stability. It contains besides the astronomical clock and Becker balances, a chronograph and a cathetometer.

The fourth room has been fitted up as a general workshop. It contains lathe, carpenter's bench, etc. This room communicates with a

larger room in which the engine, dynamos and other heavy machinery are placed, the boiler being in the "general boiler-room."

On the second floor are three rooms, the first of which is the private laboratory and office of Professor Michelson. The next room contains cases for apparatus not in use, as well as tables for work not requiring great steadiness. The third room is used as a lecture-room.

The following may be mentioned as among the more important pieces of apparatus:—

Armington & Sims Engine, 10 H. P., Screw cutting lathe, Edison dynamo, Becker balance, 1000 gm., dividing engine, cathetometer, Rowland's Spectrometer, with 6 in. concave grating, (ordered) astronomical clock, chronograph, Ritchie air pump, Ruhmkorff coil, 30 cm. spark, revolving mirror, refractometer (for measuring wave-lengths).

In addition to the facilities briefly mentioned, in the way of apparatus for original investigation, it is proper to mention that the physical library includes most of the modern standard works of reference and physical Journals. Among the latter is a complete set of the *Annales der Chemie und Physik*; of the *Comptes Rendus*; *Philosophical Transactions*, and *Phil. Mag.*, and other works.

DR. WEBSTER,

Who began his work since the last Register was published, is the author of:

Versuche über eine Methode zur Bestimmung des Verhältnisses des electromagnetischen zur electrostatischen Einheit der Elektrizität.—Inaugural Dissertation, Berlin, 1890.

III.

CHEMISTRY.

WORK OF THE PAST YEAR.

Instruction has been given in this department by

J. U. NEF, PH. D., Assistant Professor of Chemistry.

M. LOEB, PH. D., Docent in Chemistry.

F. W. MUTHMANN, PH. D., Docent in Chemistry.

J. F. WILLIAMS, PH. D., Docent in Chemistry.

Owing to the fact that all the students in this department were advanced men, it was found unnecessary to give the more elementary courses announced last Summer, such as lectures on general inorganic chemistry and chemical analysis.

DR. NEF.

During the past year Assistant Professor Nef, who has acted as head of the Laboratory, has lectured as follows:

A course of Lectures on ORGANIC CHEMISTRY, three hours per week, all the year.

Special lectures were given on the fatty compounds, confined to the hydrocarbons, their halogen and nitro derivatives, the alcohols, ethers, amines, ketones, aldehydes, acids and the metallo-organic compounds. Besides discussing the characteristic reactions and relationships of these compounds, most attention was given to recent work on the subject.

Lectures on the AROMATIC SERIES. The object here again was to discuss the most recent advances made (four lectures alone being given on the constitution of Benzol), and so to incite the men to original methods of thinking and to become familiar with the chemistry of today as presented in the original papers.

The last part of the year will be taken up by special lectures on the urea and sugar group, in which the chemistry of these groups will be presented in detail, including recent work to date.

DR. LOEB.

DR. LOEB has given two lectures each week from October to March, on PHYSICAL CHEMISTRY, embracing an historical review of stoichiometry; the physical characteristics of gases treated empirically and

theoretically, with their application to molecular problems; the relations between the gaseous and liquid states; the behavior of mixtures and the chemical problems involved; the properties of solids; a glance at electro chemistry.

DR. MUTHMANN.

Has given a course of lectures on Spectrum Analysis. In this course a review of the different methods of obtaining spectra and of the reactions of the more important substances was given, as well as a short survey on Absorption Spectra and on quantitative Spectrum Analysis. In connection with these lectures the different methods above mentioned were demonstrated in practical exercises, with an ordinary Bunsen Apparatus and a larger Apparatus constructed by Krüss in Hamburg.

In the last part of the term a course of lectures on the determination of atomic weights will be given, in which special attention will be paid to the methods of Stas.

DR. WILLIAMS.

DR. J. FRANCIS WILLIAMS was granted leave of absence early in the scholastic year, in order that he might return to Arkansas and complete the work upon the igneous rocks of the State, which he had begun during a similar leave of absence granted to him the previous year. These investigations were carried on under the auspices of the Geological Survey of Arkansas. He remained in Arkansas until the first of April, 1891, and divided his time between field-work and the preparation of his manuscript for publication. The result of these investigations will form Vol. II. of the annual report of the Geological Survey of Arkansas for 1890.

Immediately upon his return from the Southwest, a course of twenty lectures on crystallography was announced by Dr. Williams, and the first lecture was delivered on April 1st.

DR. S. P. MULLIKEN,

Who began his work since the last Register was published, has been engaged in an investigation of the electrolysis of organic compounds, and is the author of

A dissertation, (Leipzig, 1890), Ueber die Constitution der Chlorzimmersäuren.

MR. CHARLES WALKER,

Who began his work since the last Register was published, is the author of

Oxidation of Meta-Brom Toluene and Nitrotoluene Sulphamide. A. Ch. J., Vol. 8, p. 185.

Oxidation of Para-Xylene Sulphamide. A. Ch. J. Vol. 9, p. 93.

Joint publications with Dr. W. A. Noyes.

LABORATORY WORK.

The laboratory instruction this year has been under the supervision of Drs. NEF and MUTHMANN, the former paying special attention to

students at work on organic preparations or prosecuting research work in organic chemistry, the latter devoting himself to those engaged in qualitative and quantitative analysis and those prosecuting research work in inorganic chemistry.

In the organic preparation work, Emil Fischer's book is followed, and the men are strongly advised to devote all the time possible to reading the original papers in connection with their work.

In quantitative and qualitative analysis the pamphlets of Volhard and Zimmermann are used.

The following laboratory courses will probably be given from year to year ;

1°. *General Chemistry Experiments*,—Volhard, introductory to chemical analysis, 10 hours per week all the year.

2°. *Qualitative Analysis*, 15-20 hours per week all the year.

3°. *Quantitative Analysis*, 20 hours per week all the year.

4°. *Laboratory Practice* in determining molecular weights by vapor density and osmotic pressure methods under Dr. Loeb's direction.

5°. *Spectrum Analysis*, practical exercises under Dr. Muthmann's directions, 4 hours a week for half a year.

6°. *Organic Preparations*, 20 hours per week all the year, under the direction of Dr. Nef.

The more elementary laboratory courses are intended for those who elect chemistry as a subsidiary subject for their examination for the degree of Ph. D. The more advanced courses as well as the seminary are intended for those who are candidates for, or already have obtained the degree of Ph.D.

CHEMICAL JOURNAL MEETINGS.

Meetings have been held regularly on Tuesdays from 4 to 6 p. m. throughout the year for the discussion of recent work in Chemistry. All connected with the chemical laboratory have been present regularly, each in turn taking part by presenting a piece of recent research work (either assigned or chosen). Generally three papers have been discussed at each meeting.

WORK OF NEXT YEAR.

DR. NEF.

During the coming year DR. NEF will offer the following courses :

A course of lectures similar in scope and object to those given this year. To understand these lectures a good knowledge of organic chemistry is necessary.

Lectures on the more complicated aromatic compounds, with special reference to quinoline and pyridin derivatives. Lectures three hours a week throughout the year.

The chief object in these lectures will be to discuss recent work in these lines, and the student will be expected to spend much time in reading the original papers.

The work of other instructors will be announced later.

ROOMS AND FACILITIES.

A large Chemical Building, described elsewhere, has been completed and about half of the rooms already equipped for scientific work.

On the second floor of the chemical building is a large research room, and adjacent to it a store room, balance room, and combustion room, and lecture room. On the first floor is a steam room, air furnace room, and store room.

The large research room has ten working tables, each 12 feet long, and provided with gas and water and a trough in the middle—making it possible to carry on filtration, distillation in vacuum, and most chemical operations even on a large scale. There are sinks at each end of the tables, and for each table a separate large glass hood (2x5 ft.) with a height of 5 feet, making ten hoods in all.

On the third floor is the library, a large room equipped with all the periodicals, past and current, necessary for research work.

DR. NEF has a large room fitted up for his organic research work. It contains a desk equipped with gas and water and a lead trough just as the research room desks; also a large glass hood nine feet long, a sink, and a foot bellows and blast lamp.

DR. MUTHMANN has three rooms at his disposition.

1. A room for microscopic and spectroscopic work, equipped with an analytical balance, a Fuess' microscope and polarization apparatus; a Krüss' spectral apparatus for qualitative and quantitative analysis, as well as for spark-spectra.

2. A dark room, equipped with a Fuess' goniometer, No. 2, with arrangements for monochromatic light and for measuring optical axes and refractive indices of crystals.

3. A small place in the cellar is fitted up for nursing crystals at low and constant temperature.

DR. WILLIAMS has this year had two rooms placed at his disposal.

1. A private chemical laboratory for the quantitative chemical examination of minerals and rocks. This room is fitted with all the appliances for quantitative chemical work.

2. A room next to the one just mentioned is fitted up especially for microscopic and petrographic work. This room is also equipped with a black-board and demonstration table so that lectures on crystallography and petrography can be given where the material for illustration is close at hand.

While instruction and direction in laboratory work is first in importance, the student will be expected to acquire a thorough knowledge of recent work in many lines of both inorganic and organic chemistry. It is only by this method that he will be able to concentrate his energies and do good independent work in a single direction, which it is especially desired to encourage here.

Just as a good training in organic preparation work is now considered an essential preliminary to successful research work in organic chemistry, so it is desirable that men should have preliminary training in working with the rarer inorganic elements before commencing research work in inorganic chemistry.

The chemical laboratory is now equipped with an almost complete library of periodicals, and has unusual facilities for advanced chemical work. The courses of instruction have been arranged largely to meet the wants of men who are candidates for the degree of doctor of philosophy, but are adapted also to others, both more and less advanced. They comprise (1) a regular graded series of lectures which are repeated from year to year, (2) lectures on special subjects which may cover a period of several years and which vary from year to year, and (3) a seminary where recent work in chemistry is discussed. Regular systematic courses of laboratory work have been arranged, which are given from year to year, very much like those accessible in any German laboratory.

After the student has completed all the necessary preliminary training, he can begin research work under the direction of some one of the instructors, and when sufficient material has been accrued for a thesis, present himself for the doctor's degree. The time necessary to accomplish this varies very much with different students, but it takes about two years on the average. Since the majority of college graduates who have studied chemistry as a specialty have not had sufficient preliminary training to undertake research work at once, three years post-graduate work is generally necessary to obtain the degree Ph. D.

This laboratory also offers special inducements to more mature men who have already obtained the degree Ph. D., and they are encouraged in prosecuting entirely independent work, and in special cases a private room may be equipped for their work.

Intending students of this class are urged to make known their wants to the department beforehand, so that the necessary material for their proposed work may be obtained in season. Such an advanced student, on finishing a good piece of independent work, can become a candidate for docentship, which gives him the right to deliver lectures and give instruction in the department for pay. Furthermore, in this as in other departments, a man who has taken the degree Ph. D., and can present a good thesis of work done since, may be a candidate for the title of docent.

There is no other laboratory in the country which distinctly offers inducements to men, having obtained the Ph. D. degree, to pursue their work still further. It is felt here very strongly that this is of vital importance in order to develop men who by their research work will be a credit to science in this country.

IV.

BIOLOGY.

WORK DURING THE PAST YEAR.

Instruction has been given in this department as follows:

ANIMAL MORPHOLOGY.

C. O. WHITMAN, PH. D., Professor of Animal Morphology.
J. P. McMURRICH, PH. D., Docent in Animal Morphology.
S. WATASE, PH. D., Assistant and Lecturer in Zoölogy.
C. L. EDWARDS, PH. D., Fellow in Animal Morphology.
E. O. JORDAN, S. B., Fellow in Animal Morphology.
W. M. WHEELER, Fellow in Animal Morphology.

VERTEBRATE ANATOMY.

F. P. MALL, M. D., Adjunct Professor of Anatomy.

PHYSIOLOGY.

W. P. LOMBARD, M. D., Assistant Professor of Physiology.
J. D. CARDWELL, M. D., Fellow and Assistant in Physiology.

PALEONTOLOGY.

G. BAUR, PH. D., Docent in Comparative Osteology and Paleontology.

A.—ANIMAL MORPHOLOGY.

PROFESSOR WHITMAN has given a course of lectures on EMBRYOLOGICAL PROBLEMS, directed to the more general needs of the work already begun in the laboratory. Certain fundamental questions in the evolution of animal forms have been followed up, with a view to making clear the position now occupied, and indicating the lines of research that appear to be most promising.

In connection with this course Dr. McMurrich has given one lecture on the STRUCTURE AND DEVELOPMENT OF ONE GROUP OF WORMS. Dr. Watase, a lecture on THE ARTHROPOD EYE; Mr. Wheeler, a lecture on PROBLEMS IN ARTHROPOD DEVELOPMENT.

DR. McMURRICH during the past session offered a course of lectures upon the MORPHOLOGY OF THE CTENOPHORES, giving a detailed ac-

count of their structure and embryology. Several lectures were occupied by a discussion of their affinities to Coelenterates, Echinoderms (Metschinhoff) and Turbellarians (Lang and Salensky), the various facts in favor of each of these relationships being carefully weighed. In connection with this part of the subject, a general account of the structure of the Turbellaria was given.

In addition to this course occasional lectures upon special subjects have been delivered.

During the earlier part of the session, Dr. McMurrich was engaged in completing the investigations on the structure and embryology of the Actinozoa, upon which he was at work throughout the previous year. The results of these investigations, which have thrown much valuable light upon the affinities and phylogeny, as well as upon the significance of the structure, of the forms included under the group Actinozoa, are now being published.

Latterly certain problems in the Embryology of the Crustacea have been under investigation, and promise interesting results. Experiments upon the various effects of light upon the animal organism have also been carried on, and will be continued.

B.—ANATOMY.

DR. MALL has delivered a course of lectures on the MORPHOLOGY AND DEVELOPMENT OF SEROUS AND BLOOD SPACES IN VERTEBRATES.

A part of the year has been devoted to the study of a human embryo, and the morphology of the lesser peritoneal cavity in mammals and birds. Papers on these subjects will soon appear in the *Journal of Morphology*.

DR. MILLER has, during the year, continued the study of the lobule of the lung, begun last year. It has been continued from a comparative standpoint, the aim being to obtain the distinct forms and structure of a lobule by means of reconstruction, and their relations to one another.

C.—PHYSIOLOGY.

DR. LOMBARD has lectured throughout the year upon the PHYSIOLOGY OF CIRCULATION AND RESPIRATION AND UPON THE NERVOUS MECHANISMS BY WHICH THEY ARE REGULATED. He has during the year also continued his study of voluntary muscular contractions, and the results of his work of the past two years will soon be ready for publication. In addition he has been studying the mechanics of the knee joint of the frog.

DR. CARDWELL gave a short course of lectures on ANIMAL LOCOMOTION AND COÖRDINATION. In addition to this he has acted as Dr. Lombard's assistant, and has continued his studies on the mechanics of the hip joint of the frog, and the action of the one joint muscles of the thigh. He has also assisted Dr. Lombard in his research work.

DR. MALL in connection with his anatomical and embryological

work, has been studying certain points in the physiology of the venous circulation in the abdominal cavity and has obtained some important results.

DR. HODGE delivered one lecture on SPINAL AND PERIPHERAL GANGLIA, and has continued his work on the fatigue of ganglion cells.

MR. JORDAN gave one lecture upon LEUCOCYTES.

MR. NICHOLS AND DR. SCRIPTURE have made use of the laboratory for certain portions of their research work, as have also several of the men from other departments of the University.

D.—OSTEOLOGY AND PALEONTOLOGY.

DR. BAUR has given a course of lectures on THE OSTEOLOGY ON REPTILES. A brief sketch of general Osteology was given first, the affinities and classification of Reptiles were discussed and the phylogeny and relations of the single groups examined.

Most of Dr. Baur's time was devoted to the study of the Testudinata for an extensive work now in preparation. The Osteology of the Mosasauridae, especially that of the skull, was worked out on material collected by him during the last summer in the Cretaceous of Kansas. The groups "Dinosauria" was critically reviewed, and it was shown that it was an unnatural one. In connection with the researches on Tortoises the phylogeny of the pelvis of the Vertebrata was examined. Besides extensive preparations for an expedition during the coming summer to the Galapagos Islands were made.

WORK FOR NEXT YEAR.

A.—ANIMAL MORPHOLOGY.

PROFESSOR WHITMAN will offer next year three courses of lectures, two historical and one embryological.

1. The first historical course will deal with the DEVELOPMENT OF COMPARATIVE ANATOMY, beginning with Marco Aurelio Severino, and ending with the discussions of 1830 between Etienne Geoffroy Saint Hilaire and George Cuvier. The leading aim in this course will be to show how Comparative Anatomy, starting as the handmaid of Physiology, gradually outgrew its ancillary condition, and became an independent branch of Zoölogy, with aims, conceptions, principles, and methods distinctly its own. Attention will be directed particularly to the origin and development of historic ideas, tendencies, methods and schools, as presented in the early iatric and physiological stages of Zoöatomy; in the schools of Haller, Geoffroy, and Cuvier; in the "Anatomie Philosophique" of the French, and the "Naturphilosophie" of the Germans; in the doctrines of the "Scale of Nature," "Unity of Composition," and of Types; in the hypotheses of Evolution and Epigenesis, in Homology and Teleology, etc. The biographical side of the subject will also

receive due consideration, especially in the case of such representative men as Malpighi, Swammerdam, and Leeuwenhoek of the 17th century, and Haller, Buffon, Daubenton, Linné, John Hunter, Camper, Vicq d'Azyr, Kiemeyer, Geoffroy, and Cuvier of the later period.

2. The second historical course will be devoted to a critical survey of the subject of GENERATION, embracing an analytic and comparative study of those systems which have marked the high-water level of biological thought at successive epochs from the time of Aristotle to the present.

Following the order of logical dependence rather than of chronological sequence, attention will be concentrated upon those ideas and systems, which have had the most influence in determining the general course of speculation and discovery, and which, therefore, have not only an historical, but also a present, living interest.

The doctrine of Evolution, as it stood in the minds of its originators, Malpighi, Swammerdam, and Leeuwenhoek, as advocated by Leibnitz and Malebranche, and as elaborated and defended by Bonnet and Haller, will be examined at some length, on account of its peculiar historical interest, and especially because modern Evolution has been identified with the old Evolution as finally defined by Bonnet. The identification may be, in fact is, erroneous, but the search for points of contact and of difference is not the less instructive.

The theory of Epigenesis, as developed by Aristotle, Harvey, John Hunter, and Wolff, and as confirmed and extended by von Baer and other embryologists in the earlier part of this century, will be considered *in extenso*; and its relations, both to the old and the new evolution, will be fully discussed.

The consideration of these subjects will involve theories of sex, fecundation, etc., and so will lead up to a review of modern theories of heredity, and the questions raised between the followers of Lamarck, Darwin, and Weismann.

3. The third course will be devoted to COMPARATIVE EMBRYOLOGY. The plan adopted during the past year of taking leading topics for critical study and discussion will be continued, as it seems to be the most direct method of bringing the thought of the lecturer to bear on the research work of the laboratory. The plan is essentially different from that of ordinary routine courses, in which the ground to be covered is definitely mapped out, and the subjects are treated from the systematic or descriptive standpoint. Such courses dwell mainly on the descriptive side of the subject, and approach the philosophical side only incidentally or not at all. On the other hand, the leading function of the topic course is to develop the theoretical side of the subject. The naked apprehension of facts is made subordinate to their interpretation. Facts take the form of problems, and the inquiry is not only *What*, but also *How* and *Why*.

But the cultivation of one of these functions, does not imply the exclusion of the other. A research laboratory emphasizes the importance

of both functions, and the necessity for both types of lecture courses. In fact, the two types are not characterized by a difference of function, but only by a difference in the relative prominence of the same functions.

The topic course, as here defined, leaves little room for the routine repetition encouraged by curricular schedules. The formalities of the curriculum are in fact its absolute negation. The essential condition of such a course, is freedom to adapt itself to the varying needs of the work of the Laboratory, and to keep in touch with the latest advances of the science.

The following announcement is not, therefore, to be understood as a complete statement of the course, but rather as an indication of the general nature of the work anticipated. The subjects named below are mostly in continuation of the course of the past year.

I. PHENOMENA OF REPRODUCTION.

Sexual.—Embryological Development of some of the Protozoa, Oo- and Spermatogenesis, Protandry, Maturation Phenomena, Fecundation, Modes of Copulation, Uses of Spermatophores, Caryogamic Rejuvenation, Pædogenesis, Teratogeny.

Asexual.—Sporogony, Fission, Budding, Strobilation, Regeneration.

II. PHENOMENA OF CYTO- AND CARYO-KINESIS.

III. THEORIES OF INDIVIDUALITY, VARIATION, AND HEREDITY.

IV. THE ANIMAL OVUM.

Phenomena of Cleavage, Types of Cleavage, Experimental Researches on Cleavage, &c.

V. GERM-LAYERS.

Theories of the Gastrula, Planula, Placula, Parenchymella, etc.

VI. FUNDAMENTAL ANIMAL FORMS, OR PROMORPHOLOGY.

VII. LARVAL AND FOETAL TYPES OF DEVELOPMENT.

a. Rotifera, Turbellaria, Nemertea, Annelids.

b. Dicyemids, Orthonectids, Trematodes, Cestodes, etc.

VIII. TELOBLASTIC GROWTH.

Origin and importance of in tracing the Phylogeny of the higher animals; Blastopore, Mouth, and Anus; Determination of Axes and Axial Relations; The Shifting of Axes accompanying the Introduction of Teloblastic Growth, etc.

IX. METAMERISM.

Theories of Individualization, Fragmentation, Fission, etc.; The Developmental Phenomena; Incomplete Metamerism (Pseudometamerism);

Mesoderm, Coelome, and Septa; More Important Features of Metamerism, Phenomena of Obliteration, etc.

X. FORMATION OF THE VERTEBRATE EMBRYO.

Comparison with the Annelid Embryo; Concrescence, Blastopore, etc.

Opportunities for study at a marine laboratory will be given to those connected with this department.

The publication of memoirs will be provided for in the *Journal of Morphology*.

An artist will be permanently connected with the laboratory.

THE BIOLOGICAL CLUB.

The work of this Club consists in the presentation of carefully prepared papers and lectures, dealing with subjects under investigation, or with subjects of general interest to those engaged in biological research. The lecturer undertakes an exhaustive critical review of some special field, brings together the results reached by others and by himself, points out the general bearings of the subject and the problems to be solved. The lecture is followed by general discussion, a feature which adds greatly to the interest and importance of the work. The leading idea of the Club is coöperative instruction among specialists. It becomes a means of supplementing and extending the work of the regular courses of lectures. Through such an association, it becomes possible for investigators, while concentrating attention on a special line of work, to keep informed of the progress of discovery and thought in other branches of research. It is under such conditions that individual effort is stimulated, supplemented, and made most productive, and at the same time turned to the common advantage of all. Each works for himself, but all share the results. Therein lies the remedy for any dangers that may lurk in specialization.

Monthly meetings have been held during the past session, at which the following papers and lectures were given:

- I. SCOPE AND AIMS OF THE CLUB. By C. O. Whitman.
 - II. IDEAS ON THE ORIGIN OF THE GALAPAGOS ISLANDS AND THE ORIGIN OF SPECIES. By G. Baur.
 - III. INSECT METAMORPHOSES. By W. M. Wheeler.
 - IV. THE ORIGIN AND SIGNIFICANCE OF THE BLASTOPORE. By J. P. McMurrich.
 - V. NITRIFICATION AND THE NITRIFYING ORGANISM. By E. O. Jordan.
 - VI. THE ANIMAL OVUM. By S. Wätase.
- Fortnightly meetings will probably be held during the next session.

Investigations of members appointed since the last Register was issued. DR. EDWARDS has published the following:

The Relation of the Pectoral Muscles in Birds to the Power of Flight. The American Naturalist, January, 1886.

A Review of the American Species of the Tetraodontidae [with David S. Jordan.] Proc. of the U. S. Nat. Mus., 1886.

The Influence of Warmth upon the Irritability of Frog's Muscle and Nerve. Studies from the Biol. Lab., Johns Hopkins University, Vol. IV, July, 1887.

Winter Roosting Colonies of Crows. The American Journal of Psychology, Vol. I, No. 3, May, 1888.

Notes on the Embryology of *Mülleria Agassizii* Sel. a. Holothurian common at Green Turtle Cay, Bahamas. Johns Hopkins Univ. Circ. Vol. VIII, No. 70, 1889.

Folk-Lore of the Bahama Negroes. The American Journal of Psychology, Vol. II, No. 4, August, 1889.

Some Tales From Bahama Folk-Lore. The Journal of American Folk-Lore, Vol. IV, No. XII, March, 1891.

Beschreibung einiger neuer Copepoden und eines neuen, Copepodenähnlichen Krebses, *Leuckartella paradoxa*. Zeitschrift f. Naturgeschichte, 1891.

MR. E. O. JORDAN is the author of the following:

The Numbers of Bacteria in Certain City Tap-Waters. Technology Quarterly, Vol. II, 1889, p. 322.

Phagocytosis and Immunity. Boston Medical and Surgical Journal, Vol. CXXII, 1890, p. 406.

Recent Theories on the Function of the White Blood-Cell. Technology Quarterly, Vol. III, 1890, p. 170.

Certain Species of Bacteria observed in Sewage. Report of the Mass. State Board of Health on Water Supply and Sewage, 1889-90, Vol. II, p. 821.

Investigations on Nitrification and the Nitrifying Organism [with Mrs. Ellen H. Richards.] Report of the Mass. State Board of Health, 1889-90, Vol. II.

S. WATÂSE, PH. D.

S. B. College of Sapporo, Japan, 1884; Imperial University, Tokio, Japan, 1884-1886; University Scholar. Johns Hopkins University, 1887-1888; Fellow, Johns Hopkins University, 1888-1889; Holder of Bruce Fellowship in Animal Morphology, 1889-1890, J. H. U.; Ph. D., 1890, J. H. U.

DR. WATÂSE has published the following works:

1. On the Anal and Caudal Fins of Gold Fish. Jour. College Science, Imperial University, Japan. Vol. I, pt. III, 1887.

2. Observations on the Development of Cephalopods. Stud. Biol. Lab. Johns Hopkins University, Vol. IV, 1888.

3. Structure and Development of the Eyes of Limulus. Johns Hopkins University Circulars, Vol. VIII, 1889.

4. On a New Phenomenon of Cleavage in the Ovum of Cephalopods. Johns Hopkins University Circulars, Vol. VIII, 1889.

5. On the Morphology of the Compound Eyes of Anthropods, with an Appendix on the Compound Eyes of Echinoderms. Stud. Biol. Lab., Johns Hopkins University, Vol. IV, 1890.

6. Caryokinesis and the Cleavage of the Ovum. Johns Hopkins University Circulars, Vol. IX, No. 80, 1890.

7. On the Migration of the Retinal Area and its Relation to simple (Ocelli), and Compound Eyes of Anthropods. Johns Hopkins University Circulars, Vol. IX, 1890.

8. On Caryokinesis, Woods Holl, Biological Lectures, 1890.

9. Studies on Cephalopods, I, Cleavage of the Ovum. Journal of Morphology, Vol. IV, No. 3, 1891.

MR. WHEELER is the author of the following works:

1. The Distribution of Coleoptera along the Lake Beach of Milwaukee County. Proceed. Wis. Nat. Hist. Soc., 1886.

2. The Flora of Milwaukee County, Wis. Proceed. Wis. Nat. Hist. Soc., 1888.

3. The Spiders of the Subfamily Lyssomanæ. (With G. W. and E. G. Peckham). Trans. Wis. Acad. Science, Arts and Letters, 1888.

4. Two New species of Cecidomyid Flies, Parasitic or *Antennaria Plantaginifolia*. Proceed. Wis. Nat. Hist. Soc., 1889.

5. Two Cases of Insect Mimicry. *Proceed. Wis. Nat. Hist. Soc.*, 1889.
6. Descriptions of some New North American Dolichopodidæ. "Psyche," 1890.
7. The Supposed Bot-fly Parasite of the Box-turtle. "Psyche," 1890.
8. Hydrocyanic Acid Secreted by *Polydesmus Virginienensis*, Drury. "Psyche," 1890.
9. The Embryology of *Blatta Germanica* and *Doryphora decemlineata*. *Journ. Morph.*, Vol. III, 1889.
10. Homologues in Embryo Hemiptera of the Appendages of the First Abdominal Segment of other Insect Embryos. *Am. Naturalist*, Vol. 33, 1889.
11. Ueber druesen artige Gebilde im ersten Abdominal segment der Hemipteren embryonen. *Zoöl. Anzeiger*, No. 317, '89.
12. On the Appendages of the First Abdominal Segment of Embryo Insects. *Trans. Wis. Academy Sciences, Arts and Letters*, Vol. III, '90.
13. Note on the Oviposition and Embryonic Development of *Xiphidium ensiferum*, Scud. "Insect Life," Vol. II, '90.
14. Ueber ein eigenthümliches Organ im *Locusitdenembryo*. *Zoöl. Anzeiger*, No. 343, '90.
15. Neuroblasts in the Arthropod Embryo. *Journ. of Morphology*, Vol. 4, 1891.

B.—VERTEBRATE ANATOMY.

During the coming year Dr. MALL will give a course of lectures on the development, histology, and comparative anatomy of the organs arising from the endoderm.

Opportunities will be offered to advanced students desiring to investigate special subjects in vertebrate embryology and histology.

A practical course on histology, for beginners, will probably be given.

C.—PHYSIOLOGY.

DR. LOMBARD.

The work of next year will consist of lectures by DR. LOMBARD and others, research work, and practical laboratory work.

Practical courses will be offered to such students as have a good book-knowledge of physiology, but who lack laboratory training. The character of these courses will depend largely upon the needs of the students taking them. One of these be arranged to suit the requirements of students of medicine.

Especial attention will be given to original work, and the laboratory will be open for this purpose throughout every week day. Either Dr. Lombard or his assistant will always be present. The apparatus is intended for use, and will be put at the disposal of every competent worker.

Opportunities will be given to men who wish to study experimentally special branches of physiology, with reference to their investigations in other departments of biology, and to physicians who wish to study special physiological problems connected with the practice of their profession.

LABORATORIES AND FACILITIES FOR WORK.

MORPHOLOGY.

The rooms occupied by the department of ANIMAL MORPHOLOGY are upon the third floor of the main building. The main laboratory is a large room, well lighted from the north side, and well adapted to

microscopical research. It is furnished with large and commodious work-tables made from specially prepared designs, and with all the reagents, glassware, drawing-materials, etc., required in special work. The microscopes are made by Zeiss, and furnished with full sets of his apochromatic lenses and compensating eye pieces. Dissecting microscopes of the Zeiss-Mayer pattern, Thoma and Minot microtomes, water-baths, and other appliances necessary in biological investigation have also been supplied.

Five large aquaria, the largest being eight feet in length, have been placed in the laboratory. These are supplied with running water, making it possible to keep on hand during the winter a supply of material for study and investigation. The numerous ponds in the vicinity of Worcester are convenient sources from which the aquaria may be stocked. Smaller glass aquaria, also supplied with running water, afford opportunity for the rearing of special forms which are to be kept isolated.

The lecture room, adjoining the main laboratory, is of convenient size, and is supplied with a full set of Leuckart & Nitsche's Zoölogical Charts, with a complete set of charts illustrating vertebrate embryology, and with Ziegler's Anatomical and Embryological wax-models. The nucleus of a collection of preserved specimens for lecture illustration has been provided.

Four other rooms, assigned to this department, serve as private laboratories for members of the staff.

ANATOMY.

A large room in the main building has been fitted up as an ANATOMICAL LABORATORY. It contains all the necessary apparatus required for histological and embryological research.

PHYSIOLOGY.

The PHYSIOLOGICAL LABORATORY consists of two large rooms, the one lighted by seven windows on the north, the other by seven windows on the south side. In addition to these there is a room devoted to photography. There is an ample supply of gas and water, hoods and sinks. The furniture is solid and well suited to its purpose.

The laboratory is well equipped with apparatus and instruments designed to measure and record physiological phenomena. Every piece was selected solely with reference to its usefulness in research work. In addition to these, there is an excellent supply of tools for working metals, wood and glass. These are indispensable in a research laboratory, where every new problem presents new mechanical difficulties.

The laboratory is not a museum, and only such forms of apparatus are purchased as are adapted to actual use in research. It is intended to supply as far as possible every facility for investigation.

During the past year much has been done to improve the department. Motor power has been obtained by means of storage batteries, which

are charged in the physical department, and an electric motor with appropriate shafting and pulleys. A screw-cutting lathe and many tools have been added. Several pieces of standard apparatus have been purchased, and a number of new forms of apparatus, designed especially for the research work in progress, have been constructed in the laboratory and by local mechanics.

OSTEOLOGY.

A large room has been fitted up for laboratory in comparative Osteology. The room contains a special library and the osteological collection.

V.

PSYCHOLOGY.

WORK OF THE PAST YEAR.

Instruction in this department has been given by

G. STANLEY HALL, PH. D., Temporary Professor of Psychology.

H. H. DONALDSON, PH. D., Assistant Professor of Neurology.

E. C. SANFORD, PH. D., Instructor in Experimental Psychology.

F. BOAS, PH. D., Docent in Anthropology.

W. H. BURNHAM, PH. D., Docent in Pedagogy.

A. MACDONALD, PH. D., Docent in Practical Ethics.

C. A. STRONG, PH. D., Docent in Philosophy.

C. F. HODGE, PH. D., Assistant in Neurology.

A.—NEUROLOGY.

ASSISTANT PROFESSOR DONALDSON has lectured through the year on the Anatomy of the sense organs in man and on the physical measures of intelligence. The aim of the latter course has been to review those investigations on the brain that are supposed to furnish data from which intelligence can be inferred. These lectures were illustrated by the exhibition of specimens, models, and the works of the principal investigators.

Work has been done in the laboratory on the physiology of nerve-cells, the effects of hardening reagents on nerve tissue, and the size of the cranial nerves in man. The histological examination of Laura Bridgman's brain is in progress.

B.—EXPERIMENTAL PSYCHOLOGY.

The PRESIDENT led a seminary for some weeks in a careful review of Prof. James' Psychology.

DR. SANFORD has during the past year completed his course on the physiology and psychology of the senses, begun last year, taking up, successively, hearing, taste, smell, and touch, including the related kinaesthetic senses. He has also lectured on the experimental study of Memory, Associations, Dreams, etc. Methods of experimentation have been explained, and demonstrations made in connection with these subjects. An important laboratory course has this year been given cover-

ing all the senses, reaction-times, the psycho-physic law, memory, association and attention. In the absence of any hand-book on the subject, the experiments have been written out with the mimeograph and distributed from time to time to the students. This course in somewhat more finished shape is in course of publication in the *American Journal of Psychology*.

DR. SANFORD has also directed research work and for a portion of the time acted as publisher of the *American Journal of Psychology*.

MR. NICHOLS has delivered two lectures on the Psychology of Time during the past year and has completed and published his work on *The Psychology of Time*; (See *American Journal of Psychology*; also book, Henry Holt & Co., N. Y.). He is now investigating certain phenomena of dermal psychology, particularly the nature and origin of touch and tickle; their distribution over the body; the relation of such distribution to 'use,' 'ideation' and discrimination; the whole research having a fundamental bearing upon the origin and development of ideas and judgments of number, space, locality and quality. Mr. Nichols also has in hand another research upon pleasure and pain.

DR. SCRIPTURE, who arrived from Leipzig in January, has been engaged in inventing an apparatus for the investigation of the temperature sense, in which the following conditions are to be fulfilled: 1. No varying quantity shall be allowed to enter unless accurately measured. 2. Stimulation by contact heat, radiant heat and galvanic and induction currents of every form, is to be applicable on a few minutes' notice. One of the new parts is an arm that carries the testing instrument and registers the hot and cold spots on millimeter paper by pressing an electric button. Lectures have been given on the association of ideas and memory, and on the experimental psychologists of Germany.

DR. SCRIPTURE, who began his work since the last Register was published, is the author of

Vorstellung und Gefühl, eine experimentelle Untersuchung über ihren Zusammenhang. Wundt's Philosoph. Studien, VI, Heft 4.

Ueber den associativen Verlauf der Vorstellungen. Inaug. Diss., Leipzig, 1891. Also in Wundt's Philosoph. Studien. VII, Heft 1.

Arithmetical Prodiges, Am. Journal of Psychology, IV, 1.

Zur Definition einer Vorstellung; Zur Methodik der Psychologie.

MR. BOLTON has been engaged in the following research work:

In the psycho-physical laboratory under the charge of Dr. Sanford he has just completed a problem in the study of rhythm and the time-sense. This work has a bearing upon what Wundt called the *Umfang* of consciousness and the time threshold for hearing; besides some interesting discoveries have been made upon the behavior of the memory after-image of hearing.

In the neurological laboratory under the supervision of Dr. Donaldson he is engaged in making a comparison of cross-sections of the cranial nerves in man with the weight and volume of the brain.

With the assistance of Dr. Donaldson he has prepared a translation of the description of Dr. Auzoux's large brain model and has introduced into the text synonyms for all the more important terms.

C.—ANTHROPOLOGY.

DR. BOAS gave an introductory course of lectures on physical anthropology in connection with which practical work on methods of studying the anatomy of races was carried on in the anthropological laboratory. While in a lesser course only the most salient points were treated, in another course the same field was gone over in greater detail. DR. BOAS also gave a course of lectures on the anthropology of Africa.

In April MR. CHAMBERLAIN gave a course of lectures on the Relation of Linguistics to Anthropology and Psychology.

DR. BOAS continued his investigations on the Indians of the North Pacific Coast. The greater part of the year he was engaged in work on new material collected in the summer of 1890 on the coasts of Oregon, Washington and British Columbia.

MR. CHAMBERLAIN continued his investigations on the Algonquin tribes of Canada and arranged his notes which were collected on several visits to the Mississagua Reservation.

DR. WEST applied himself to the study of Physical Anthropology, especially to investigations on growth.

MR. CHAMBERLAIN, who began his work since the last Register was published, is the author of

The Catawba Language, Toronto, 1888.

The Relationship of the American Languages. *Proc. Canad. Inst.*, 3rd Sec., Vol. V (1886-7) pp. 67-76.

The Eskimo Race and Language, *Ib.*, Vol. VI (1887-8), pp. 261-337.

The Language of the Mississaguas of Sengog, *Ib.*, Vol. VII (1888-9), pp. 213-215.

The Origin and Development of Grammatical Gender. *Ib.*, pp. 216-217.

The Archæology of Seugog Island. Port Perry, 1889.

A first contribution towards the Bibliography of the Archæology of the Dominion of Canada and Newfoundland. Annual Report of Canadian Institute, 1887-8, pp. 54-59.

A second contribution, etc. *Ibid.*, 1888-89, pp. 102-118.

A third contribution, etc. *Ibid.*, 1889-90.

The Algonkian Indians of Baptiste Lake. *Ibid.*, 1889-90, pp. 79-86.

Mississagua Etymology, "Science," Sept. 14, 1888, p. 132.

Notes on the History, Customs, and Beliefs of the Mississagua Indians. *Journal of Amer. Folk-Lore*, Vol. I, 1888, pp. 150-160.

Tales of the Mississaguas, I, *Ibid.*, Vol. II, 1889, pp. 141-147.

A Mohawk Legend of Adam and Eve. *Ibid.*, p. 228-331.

Mississagua Place-names. *Ibid.*, Vol. III, 1890, p. 74.

Tales of the Mississaguas, II, *Ibid.*, pp. 149-154.

A Negro Creation Legend. *Ibid.*, p. 302.

The Thunder-Bird amongst the Algonkins. *American Anthropologist*, Vol. III, (1890), pp. 51-54.

Notes on Indian Child Language. *Ibid.*, pp. 237-241.

The Maple Amongst the Algonkian Tribes. *Ibid.*, Vol. IV, 1891, pp. 39-43.

Algonkian Onomatology. *Trans., American Assoc. Adv. Science*, Vol. XXXVIII, 1889, pp. 351-352.

Mohawk Folk-Lore. "Science," Vol. XVI (1890), p. 289.

African and American: the Contact of the Negro and the Indian. *Ibid.*, Vol. XVII (1891), pp. 85-90.

The Aryan Element in the Indian Dialects, I. "The Canadian Indian," Vol. I. (1890-91), pp. 148-153.

Words of Indian Origin in the French-Canadian Dialect and Literature. *American Notes and Queries* (Philadelphia) Vol. I, 1888, pp. 220-1; 232-3; 258-9; 270-1; 278-9; 293-4;

305-6; Vol. II, 1888-9, pp. 2-3; 16-17, 30-31; 52-53; 62-63; 76-77; 87-88; 99-100, 124-125. Vol. IV, 1889, pp. 77-78.

Dialect Research in Canada. Dialect Notes (American Dialect Society, Cambridge, Mass.) Vol. I, No. II, 1890, pp. 43-56.

Slav Proverbs. "The Varsity" (Toronto University) April 7, 1888.

The Prehistoric Naturalist. University [Toronto] Quarterly Review, Vol. I. No. 2, (June 1890), pp. 179-197.

The Derivation of the Word "Chicago." Amer. Notes and Queries, Vol. IV, 1889, pp. 36, 91-92.

New York Dialect Forms. *Ibid.*, III, pp. 295-296.

DR. CHANNING has continued his work in Physical Anthropology and begun an investigation on the head forms of the insane.

D.—PRACTICAL ETHICS, (Criminology.)

DR. MACDONALD has conducted a "Seminar" throughout the year. Crime in general was considered from the points of view of insanity, law and alcoholism. The Psychological, Anthropological, and Sociological conditions of crime and other abnormal states were studied. Lectures were given part of the time on special phases of crime. It was sought, by means of facts of a pathological or abnormal nature, to bring out the intimate relation between the different degrees of wrong. Holding wrong to be, in its last analysis, equivalent to abnormal, an attempt was made to show the possibility of a scientific basis for ethics.

Dr. MACDONALD has also given summaries of recent literature in the *American Journal of Psychology* under the heads of Criminology, Alcoholism, Charity and Ethics, also published an article in the *Journal of Mental Science*, entitled, "Ethics as Applied to Criminology."

Practical investigations on special criminal types have been continued throughout the year.

E.—PHILOSOPHY.

DR. STRONG lectured during the early part of the year on the History of Psychology among the Greeks from Thales to Aristotle. A digest of his lectures will be printed in the *American Journal of Psychology*.

F.—EDUCATION.

DR. BURNHAM has lectured during the entire year upon Pedagogical principles, the History of Education and Present Problems in Higher and Lower Education in this country and in Europe.

The Seminary meetings, once a week through the year, have been devoted to special subjects and methods in different branches of school work. Papers have been read and discussions and investigations conducted, not only by members of the Seminary, but by Instructors from other departments of the University. Brief reports on current literature and important institutions in this country and in Europe have been presented. Much of this work has been printed in the *Pedagogical Seminary*, a journal which is the organ of this department.

DR. BURNHAM has also conducted educational excursions, Saturday

afternoons, to many educational institutions in Worcester, Boston and elsewhere.

PRESIDENT HALL has also given lectures upon special institutions, problems and particularly upon the educational systems of the different countries of Europe as they exist to-day. Both PRESIDENT HALL and DR. BURNHAM have been sent to Europe by the University to collect material and study the systems and institutions of different countries in the interests of this department.

MR. POTTER has during the year made a study of the history of methods of teaching geography, especially in Germany; the qualifications and licensing of teachers in the United States compared with other countries; and the history of methods in singing, the results of which will soon be ready for publication.

MR. REIGART has made special studies in physical measurements of children and English normal schools. MR. CONANT has studied scientific and specially mathematical education. This work and that of other members of the department will appear in the *Pedagogical Seminary*.

WORK OF NEXT YEAR.

DR. HALL.—PSYCHOLOGY.

DR. HALL will direct next year the work of a few special students, in both psychology and education. His announcements will be made later.

DR. DONALDSON.—NEUROLOGY.

The work of next year will be in the direction of further research along neurological lines, seminary work on some selected subjects, and lectures and demonstrations on the normal and pathological anatomy of the central nervous system and sense organs—the precise form of which will be determined by the needs of those students who present themselves in the fall.

DR. SANFORD.—EXPERIMENTAL PSYCHOLOGY.

Next fall DR. SANFORD will lecture upon special problems in Experimental Psychology in particular upon Hypnotism and Instinct. It is hoped to make the lectures on both these subjects in some degree demonstrational. In the spring a short course will be given upon the representative men of modern Physiological Psychology.

Throughout the year a practice course will be given, following the lines of that now being printed in the *American Journal of Psychology*.

The laboratory will be open for original work at such times as prove convenient to those engaged in it.

DR. BOAS.—ANTHROPOLOGY.

The work of next year will be: 1. Lectures and laboratory work on Physical Anthropology. 2. A course of lectures on the Application of Statistics to Anthropology.

FACILITIES.

The Neurological Laboratory consists of one large room (21 x 40 ft.) and one smaller room, which have been furnished and equipped for this work alone. It is under the direction of DR. DONALDSON, assisted by DR. C. F. HODGE. It affords all needed facilities for verification and investigation in the field of Neurology, and is well furnished with apparatus for histological work. It contains also a good equipment of illustrative apparatus, such as a model of the human brain, by Aeby; a large dissectible brain, medulla and cord, by Auzoux; Ziegler's models of animal brains, etc. The collection of Neurological literature, both current and historical, is unusually extensive.

The Psychological Laboratory has been apportioned a suite of rooms on the second floor, consisting of one large and three small rooms. The large room is used for general laboratory purposes, and one of the smaller rooms is set apart for chronoscopic experiments.

Since the issue of the last Register almost all the apparatus then announced as in process of construction has been received. Apparatus is now being collected or devised for the exact study of the temperature sensations. Three large pieces of apparatus for the study of the perception of positions and motions of the body as a whole, and of the sense of rotation have been constructed at the University, also a large Wheatstone stereoscope, Hering's instrument for simultaneous contrast, and miscellaneous laboratory fittings. Orders for other instruments have also been placed, and the instruments themselves are expected by next fall. The laboratory is still strongest in apparatus for time measurements and psychological optics, though by no means deficient in other lines. Apparatus for special work will be purchased from time to time during the year.

Since the issue of the last Register the Anthropological Department has added materially to its equipment. It now occupies a large room (Nos. 55-56) on the third floor and is well provided with books on anthropological subjects. In the laboratory opportunity is offered to become acquainted with the use of anthropological instruments and with the application of anthropological methods.

The equipment of the Educational Department now consists of over fifty journals, chiefly European, a very carefully selected library, the classification of which is given elsewhere in the Register, and large and carefully selected sets of illustrative apparatus, such as charts, cuts, diagrams, object lessons, the French Musée Industriel Scolaire, comprising over six hundred objects; the official publications of the various ministries of Education in Europe; a carefully catalogued collection of City and State Reports in this country, etc.

DEPARTMENT OF MODERN LANGUAGES.

The work in this department has been under the charge of MR. CAMILLE RIED throughout the year. The object of instruction in this

department has been to give to those scientific students who desired it further practical knowledge of modern languages that they might better command the literature of their own special departments. Work in scientific philology, or in the study of literature, as such, has not been attempted.

During the past year the work has been as follows:

German.

Exercises in conversation.

Reading of 'Über Bakterien' by Dr. Ferdinand Cohn. 'Über Goethe's naturwissenschaftliche Arbeiten' by H. Helmholtz. 'Die Erziehung der deutschen Jugend' by Paul Güssfeldt.

French.

Whitney's French Grammar. Reading of 'Petite Histoire du Peuple Français' par Paul Lacombe. Exercises in conversation.

Italian.

BEGINNERS. Sauer's Italian Grammar. Read: 'Il Fante di Picche' by Salvatore Farina.

Spanish.

Grammar was taught from the blackboard. Read: 'Historia de Gil Blas de Santillana' por Le Sage.

LIBRARY.

The University Library now contains 13,572 bound volumes and 1,268 pamphlets, and the reading room receives 239 journals. With the exception of 3,169 congressional publications and other contributed volumes the library and the journals represent chiefly the five departments.

The books are grouped as follows :

A WORKS OF GENERAL REFERENCE.	I PSYCHOLOGY.
B JOURNALS.	J PHILOSOPHY.
C MATHEMATICS.	K ETHICS.
D PHYSICS.	L CRIMINOLOGY.
E CHEMISTRY	M ANTHROPOLOGY.
F ZOÖLOGY.	N EDUCATION.
G PHYSIOLOGY.	O BOTANY.
H PATHOLOGY.	

Books not included under any of these subjects are grouped as Miscellaneous, and marked according to their Room, Case, Tier, and Shelf. They comprise in addition to Congressional publications, bound files of magazines, several score of rare old books, a collection of Art publications, Travels, Complete Works, Sets of Reports, Histories, Biographies, etc.

The Library of the University at present consists of six rooms. I. The large General Room containing A, B, C, D, F, G, H, I, J, K, L, M, and O. II. The Journal Room. This contains chiefly current numbers of journals and books of reference. The Journals are arranged on broad shelves on each side of the room for ready inspection. III. The Educational Room. This contains all the Educational works except State and City Reports and College publications, which have a place and a catalogue by themselves. IV. Chemical Library Room, containing both the books and periodicals in that department and labelled C. V. A small store room for books not yet placed on the shelves or catalogued. VI. A

small room for duplicates, unbound copies of journals, etc. Besides the subject classification, books are arranged in cases, tiers, shelves, etc. The italicized words in all the following subject lists are the words on the shelf-labels.

C.—MATHEMATICS.

In Mathematics, C, the books are grouped in ten divisions, designated by the numerals 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, immediately following the letter C; every division is subdivided into sections of which each is designated by a second numeral following that indicating the division. The cipher, 0, always denotes a miscellaneous division or section. The mathematical works are arranged on the shelves in accordance with the following classification, the subdivisions of which, however, are not all used at present. The italicised part of each title is that printed on the sliding shelf-label.

The words in the following divisions and sub-divisions in all departments, which are italicised are the words on the movable shelf-labels, to which this will serve as a fuller key.

- | | |
|---|---|
| C 1. HISTORY AND PHILOSOPHY. | C 5. ALGEBRA. (For Multiple |
| C 1. 1. <i>Bibliography.</i> | Algebra see C 3. 3.) |
| C 1. 2. <i>History.</i> | C 5. 1. <i>Elementary Algebra.</i> |
| C 1. 3. <i>Biography.</i> | C 5. 2. <i>Determinants.</i> |
| C 1. 4. <i>Philosophy.</i> | C 5. 3. <i>Theory of Equations.</i> |
| C 2. COLLECTIONS. | C 5. 4. <i>Simultaneous Equations.</i> |
| C 2. 1. <i>Works, complete and se-</i> | C 5. 5. <i>Transformation.</i> |
| lect. | C 5. 6. <i>Invariants.</i> |
| C 2. 2. <i>Compendia. Dictionaries.</i> | C 6. INFINITESIMAL CALCULUS. |
| C 2. 3. <i>Tables. Formulæ.</i> | C 6. 1. Limits and <i>Infinite Se-</i> |
| C 3. SYMBOLISM AND OPERA- | ries. |
| TION. | C 6. 2. Functions of a <i>Real</i> |
| C 3. 1. <i>Symbolic Methods.</i> | Variable. |
| C 3. 2. <i>Operations.</i> | C 6. 3. <i>Differential Calculus.</i> |
| C 3. 3. <i>Multiple Algebra.</i> (ref. | C 6. 4. <i>Integral Calculus.</i> |
| C 9.) | C 6. 5. <i>Total Differential Equa-</i> |
| C 3. 4. <i>Symbolic Logic.</i> | tions. |
| C 3. 0. <i>Miscellaneous Symbols.</i> | C 6. 6. <i>Partial Differential</i> |
| C 4. ARITHMETIC. | Equations. |
| C 4. 1. <i>Elementary Arithmetic.</i> | C 6. 7. Functions Derived from |
| C 4. 2. <i>Continued Fractions.</i> | Differential Equations. |
| C 4. 3. <i>Numerical Series.</i> | Spherical Harmonics. |
| C 4. 4. <i>Finite Differences and</i> | C 6. 8. <i>Calculus of Variations.</i> |
| Summation. | C 7. THEORY OF FUNCTIONS. |
| C 4. 5. <i>Permutations and Com-</i> | C 7. 1. <i>General Theory.</i> |
| binations. | C 7. 2. <i>Algebraic Functions.</i> |
| C 4. 6. <i>Probabilities.</i> | C 7. 3. <i>Exponential and Trigo-</i> |
| C 4. 7. <i>Theory of Numbers.</i> | nometric Functions. |

- C 7. 4. *Elliptic Function and Integrals.*
 C 7. 5. *Hyperelliptic and Abelian Functions and Integrals.*
 C 7. 6. *Various Functions* (fuchsiennes, etc.).
 C 7. 7. *Functions of Several Variables.*
- C 8. GEOMETRY.**
 C 8. 1. *Elementary Geometry and Trigonometry.*
 C 8. 2. *Analysis Situs.*
 C 8. 3. *Analytic Geometry in General.*
 C 8. 4. *Projective Geometry.* Modern Synthetic Geometry.
 C 8. 5. *Special Systems of Geometric Analysis.*
 C 8. 6. *Plane Loci* in particular.
 C 8. 7. *Loci in 3 Dimensions* in particular.
- C 8. 8. *Hyperspace and Non-euclidean Geometry.*
 C 8. 9. *Applications of Geometry.*
- C 9. EXTENSIVE ALGEBRA.** (ref. C 3. 3.)
 C 9. 1. *Geometric Representation of the Imaginary.*
 C 9. 2. *Quaternions.*
 C 9. 3. *Geometric Algebras* (Clifford).
 C 9. 4. *Ausdehnungslehre* (Grassmann).
 C 9. 5. *Equipollences* (Bellavitis).
- C 0. MISCELLANEOUS.**
 C 0. 1. *Apparatus.*
 C 0. 2. *Recreations, Games, Puzzles, etc.*
 C 0. 9. *Paradoxes and Paradoxers.* Circle-squaring, etc.

As B is the general designation of Periodicals, each Periodical exclusively devoted to one department is designated by B, followed by the letter of the department to which it belongs, thus:

B C. MATHEMATICAL PERIODICALS.

B A. MISCELLANEOUS PERIODICALS. Transactions of Learned Societies, etc.

So long as the number of books in any section is very small, they will be grouped under the division to which that section belongs, and will be designated only by the number of that division. All books which refer to several divisions are placed in the division C 2. (Collections), and all books referring to several sections of any one division are grouped under that division, unless they refer but slightly to more than one division or section. Volumes of a set are not separated, but the whole set is classed as if it were a single volume. Otherwise every book is placed in the narrowest division or section to which it belongs.

D.—PHYSICS.

The books belonging to the department of Physics, which already form the nucleus of a good working library, and for additions to which large orders are being filled, are arranged under the following heads:

D 1. *General.*—Collected Works. D 4. *Electricity and Magnetism.*

- | | |
|--|--------------------------|
| D 2. <i>Experimental and Manipulation.</i> | D 5. <i>Light.</i> |
| D 3. <i>Mathematical.</i> | D 6. <i>Heat.</i> |
| D 3. b. <i>Mechanics.</i> | D 7. <i>Sound.</i> |
| | D 8. <i>Meteorology.</i> |

E.—CHEMISTRY.

- | | |
|--|--|
| E 1. <i>Periodicals.</i> | E 6. <i>Analysis.</i> |
| E 2. <i>General, Theoretical and Physical.</i> | E 7. <i>Mineralogy, Crystallography and Petrography.</i> |
| E 3. <i>Historical.</i> | E 8. <i>Technology.</i> |
| E 4. <i>Organic.</i> | E 9. <i>Manipulation and Apparatus.</i> |
| E 5. <i>Inorganic.</i> | E 10. <i>Monographs.</i> |

F.—ZOOLOGY.

- | | |
|--|--|
| F I. <i>General Biology, (a) octavos (b) quartos. Vertebrates.</i> | |
| F II. <i>Text Books and Books of Reference. (a) octavos (b) quartos.</i> | |
| F III. <i>Tunicates. (a) octavos (b) quartos.</i> | |
| F IV. <i>Arthropods. " " " "</i> | |
| F V. <i>Molluscs. " " " "</i> | |
| F VI. <i>Worms. " " " "</i> | |
| F VII. <i>Echinoderms. " " " "</i> | |
| F VIII. <i>Coelenterates. " " " "</i> | |
| F IX. <i>Protozoa. " " " "</i> | |

G.—PHYSIOLOGY.

- | |
|--|
| G I. <i>Text Books, Manuals.</i> —Text books and books on physiological technique. |
| G II. <i>Octavos, Etc.</i> —Books, monographs, and bound pamphlets, of ten inches or less in height. |
| G III. <i>Folios, Etc.</i> —Books, monographs, and bound pamphlets, of more than ten inches in height. |
| G IV. <i>Pamphlets.</i> —Unbound pamphlets. |
| G V. <i>Collected Studies, Etc.</i> —Arbeiten, Studien, Travaux. Beiträge, etc. |
| G VI. <i>Physiological Journals.</i> —Periodicals, Proceedings of Societies, etc. |

In the first four of the above divisions of Physiology the books are arranged alphabetically by authors and in the fifth alphabetically by titles. This arrangement, permits books to be found only when the name of the author is known. The nature of Physiological literature prevents a satisfactory shelf classification of books by subject. Physiological processes are so dependent on each other, that every book and article deals with many functions, and might well be arranged under any one of several heads. An index subject catalogue, which permits of many

cross references, is, therefore, the only resort. A plan for such a card catalogue, which it is hoped will in time embrace all the books and articles of Physiological interest in the library, is at present under consideration.

H.—PATHOLOGY.

Alphabetically by Authors.

I.—PSYCHOLOGY.

The books of the Psychological department are at present arranged, for convenience and not according to any theoretical classification, and are placed alphabetically by author's names. The list of Psychological works is small, because it has seemed best to arrange the Library as a whole, from the standpoint of science and not from the Psychological standpoint. Accordingly all books on Pathology though ordered by the Psychological department, have been placed on the Pathological shelves, all those on Physiology, with the Physiological books, those on Instinct, with the Biological, those on Myth and Custom, with the Anthropological, and so on. While the phenomena of mind in all these departments undoubtedly belong to Psychology, the facts and the simple statement of them belong as clearly to the departments of science that have accumulated them.

J.—PHILOSOPHY.

Alphabetically by Authors. (a.) octavos (b.) quartos.

K.—ETHICS.

Alphabetically by Authors.

L.—CRIMINOLOGY.

Alphabetically by Authors. (a.) octavos (b.) quartos.

M.—ANTHROPOLOGY.

The books of the Anthropological Department are divided into two groups: General Anthropology and Special Ethnography. The former is subdivided as follows:

- M I. *Handbooks.*
- M II. *Physical.* (a.) octavo (b.) quarto.
- M III. *Archæology.*
- M IV. *Ethnology.* (a.) octavo (b.) quarto.
- M V. *Religious.*
- M VI. *Mythology* and Folk-lore.
- M VII. *Linguistics.* (a.) octavo (b.) quarto.

The second group contains besides monographs of peoples and tribes, books of travel, historical works, etc., which contain matter of anthropological interest. It is arranged geographically :

- M VIII. *North America.* (a.) octavo (b.) quarto.
- M IX. *Central and South America.* (a.) octavo (b.) quarto.
- M X. *Africa.* (a.) octavo (b.) quarto.
- M XI. *Pacific Ocean and Australia.* (a.) octavo (b.) quarto.
- M XII. *Asia.* (a.) octavo (b.) quarto.
- M XIII. *Europe.*

N.—EDUCATION.

- N 1. *Cyclopedias and Books of Reference.*
- N 2. *General Historical Works.*
- N 3. *Histories of Special Institutions.*
- N 4. *General Surveys and Reports on the Present Condition of Education.*
- N 5. *Standard Writers on Education and Biographies.*
- N 6. *Educational Psychology.*
- N 7. *General works on the Theory of Education.*
- N 8. *Methods on Special Subjects.* (Reading, Arithmetic, Geography, History, Music, and the like).
- N 9. *Physical and School Hygiene.*
- N 10. *The Study of Children, the Kindergarten, etc.*
- N 11. *The State and Laws, Civic Education, Administration and School Organization.*
- N 12. *Industrial and Technical.*
- N 13. *Miscellaneous.*
- N 14. *School Calendars, Etc.* Annual Reports, Programmes, and the like (mostly foreign).
- N 15. *Education of Defectives.*
- N 16. *Art Education, including Museums, Etc.*
- N 17. *The Training of Teachers.* Examinations, Etc.
- N 18. *Moral Education and School Discipline.*
- N 19. *University Education.*
- N 20. *The Learned Professions.*
- N 21. *Special Topics.*
- N 22. *Special Reports of the Bureau of Education.*
- N 23. *Miscellaneous Pamphlets.*
- N 24. *Periodicals.*
- N 25. *Miscellaneous Reports.* a. American. b. English. c. French.
- N 26. *Text-books.* a. Mathematics. b. Science. c. Drawing, Etc. d. Reading. e. Language. f. Geography. g. Music. h. Miscellaneous.
- N 27. *Old Text-books, with same subdivisions as the above.*
- N 28. *State and City Reports, subdivided by states.*
- N 29. *Charts, Maps, Pictures, Etc.*

The Library has now two card catalogues :

I. An author's catalogue arranged alphabetically with miscellaneous and anonymous sections, so that nearly all books in the Library are represented in it.

II. A subject catalogue which is at the same time a shelf and an inventory catalogue. This is arranged on a new plan as follows : Every volume and every pamphlet has its card, so that each card represents a volume. All the books are classified and arranged upon the shelves according to the departments, divisions and subdivisions given above, but under each subdivision books are placed alphabetically by authors. While each case, tier and shelf is permanently labelled, the demarcation between the subdivisions is made by sliding shelf label holders bearing the subject, division, and subdivision. These label holders being movable the subdivisions can easily be enlarged as new books are added.

In Mathematics for instance C. 1, History and Philosophy, comes first, with the first subdivision C 1, Bibliography. First on the top shelf, and therefore first in the catalogue drawer set apart for these tiers comes Bibliography beginning with authors in A and so on through the alphabet to the end of the subject. Then comes History, Biography, etc., on through Mathematics and the other departments, the order of cards being identical with the order of the books upon the shelves, reading down the tiers as down a printed page.

In the drawers the book cards are separated by red cards projecting on the right above the others, and on these projections the tier and shelf divisions are marked ; they are also separated by blue cards projecting above the others on the left hand side, on which the subjects are marked. Whenever the position of any book is changed, it is only necessary to make a corresponding change in the position of its card. The shelf position of each book is marked in pencil, not upon these cards, but upon each card in the author's catalogue, and in the book itself, in order that it may be readily found and replaced.

New books, after being entered in the author's catalogue, are kept in a case reserved for them for a few weeks before being permanently placed in the shelves and entered in the inventory catalogue.

All the privileges of the Library are open to all appointees of the University alike.

The Library is open from 8 A. M. to 6 P. M. and each member of the University has direct access to every book and journal.

Outside the University are found :

The Library of the Antiquarian Society, organized in 1812, containing 85,000 volumes, and which is accessible to all members of the University.

The Worcester Public Library, containing about 250 periodicals and 75,000 volumes, has supplemented the scientific publications purchased by the University and all the privileges are accessible without charge.

A Medical Library of 8,000 volumes is also accessible.

By the courtesy of the Librarian of Harvard University and of the Surgeon General at Washington books from both these institutions are sent to the University for a limited time, and by the courtesy of S. S. Green of the Worcester Public Library, all the resources of that institution and its facilities for borrowing from distant libraries are available to all members of the University.

By an arrangement with several large book dealers the latest publications from Europe as well as from this country are exposed for inspection or sale upon the Library tables.

LIBRARY RULES.

1. No loud talk is allowed in any part of the Library or Reading Room.

2. Any book may be called in at three day's notice at the discretion of the Secretary of the Library Committee.

3. Any member of the staff may reserve from circulation such books as he deems necessary in connection with the courses given in his department; and these shall be placed in a case, by themselves, marked "Reserved," in the Reading Room.

4. Current numbers of Periodicals shall not be taken out until they have been in the Library two weeks.

5. Reserved books and current numbers of periodicals,

exempt from circulation, may be taken out after 5.30 P. M., but must be returned before 9 o'clock the next morning, excepting that such books, taken out Saturday P. M. may be kept until 9 o'clock the next Monday A. M.

6. All Dictionaries, Cyclopædias, and books of general reference, are permanently reserved.

7. Books of great value may be taken out only by special permission.

HISTORY AND BUILDINGS.

Clark University was founded by the munificence of a native of Worcester County, whose plans, conceived more than twenty years ago, have gradually grown with his fortune.

He has done so with the strong and express desire that the highest possible academic standards be here forever maintained ; that special opportunities and inducements be offered to research ; that to this end the instructors be not overburdened with teaching or examinations ; that all available experience, both of older countries and our own, be freely utilized, and that new measures, even innovations, if really helpful to the highest needs of modern science and culture be no less freely adopted ; in fine, that the opportunities of a new foundation in this land and age be diligently explored and improved.

He has chosen Worcester as the seat of the new foundation after mature deliberation—first :

Because its location is central among the best colleges of the East, and by supplementing rather than duplicating their work, he hopes to advance all their interests and to secure their good will and active support, that, together, further steps may be taken in the development of superior education in New England ; and secondly :

Because he believes the culture of this city will ensure that enlightened public opinion indispensable in maintaining these educational standards at their highest ; and that its wealth will ensure the perpetual increase of revenue required by the rapid progress of science.

As the first positive step towards the realization of his

long-formed plans, MR. CLARK invited the following gentlemen to constitute with himself a Board of Trustees :

STEPHEN SALISBURY,

A. B., Harvard, 1856; Universities of Paris and Berlin, 1856-58; Harvard Law School, 1859-61; President Antiquarian Society since 1887.

***CHARLES DEVENS,**

A. B., Harvard, 1838; Harvard Law School, 1840; Major-General, 1862; Judge of Supreme Court, 1857; United States Attorney General, 1877-81; LL. D., Columbia and Harvard, 1877; Judge Supreme Court since 1881.

GEORGE F. HOAR,

A. B., Harvard, 1846; Harvard Law School, 1849; United States House of Representatives, 1868-76; United States Senate since 1876; LL. D., William and Mary, Amherst, Harvard and Yale.

WILLIAM W. RICE,

A. B., Bowdoin, 1846; admitted to the Bar, 1854; United States House of Representatives, 1876-86; LL. D., Bowdoin, 1886.

†JOSEPH SARGENT,

A. B., Harvard, 1834; M. D., Harvard, 1837; London and Paris Hospitals, 1838-40.

JOHN D. WASHBURN,

A. B., Harvard, 1853; Harvard Law School, 1856; Representative, 1876-79; State Senate, 1887; United States Minister to Switzerland, 1889.

FRANK P. GOULDING,

A. B., Dartmouth, 1863; Harvard Law School, 1866; City Solicitor since 1881.

GEORGE SWAN,

A. B., Amherst, 1847; admitted to Bar, 1851; Member of Worcester School Board since 1879; Chairman of High School Committee.

To fill the vacancy in the Board caused by the death of Dr. Joseph Sargent, the unanimous choice of the Trustees, at a meeting held October 2d, 1889, fell upon

EDWARD COWLES,

A. B., Dartmouth, 1859; M. D., Dartmouth, 1862, and College of Physicians and Surgeons, N. Y., 1863; Assistant Surgeon U. S. A., 1863-72; Resident Physician and Superintendent Boston City Hospital, 1872-79; Med. Supt. McLean Asylum, Somerville, Mass., since 1879; Professor of Mental Diseases Dartmouth Med. School, since 1885; Clinical Instructor in Mental Diseases, Harvard Medical School, since 1888.

A petition for a charter was at once made by this board, and granted by the Legislature Jan. 18, 1887.

The following is the

*Died Jan. 7, 1891.

†Died Oct. 12, 1888

ACT OF INCORPORATION.

CHAPTER 133.

COMMONWEALTH OF MASSACHUSETTS, IN THE YEAR ONE THOUSAND EIGHT HUNDRED AND EIGHTY-SEVEN. AN ACT TO INCORPORATE THE TRUSTEES OF CLARK UNIVERSITY IN WORCESTER.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by authority of the same, as follows:

SECTION 1. Jonas G. Clark, Stephen Salisbury, Charles Devens, George F. Hoar, William W. Rice, Joseph Sargent, John D. Washburn, Frank P. Goulding and George Swan, all of the city of Worcester, in the Commonwealth of Massachusetts, and their successors, are hereby made a corporation by the name of the Trustees of Clark University, to be located in said Worcester, for the purpose of establishing and maintaining in said city of Worcester an institution for the promotion of education, and investigation in science, literature and art, to be called Clark University.

SECTION 2. Said corporation may receive and hold real or personal estate, by gift, grant, devise, bequest or otherwise, for the purpose aforesaid, and shall have all the rights, privileges, immunities and powers, including the conferring of degrees, which similar incorporated institutions have in this Commonwealth.

SECTION 3. Said corporation shall have the power to organize said University in all its departments, to manage and control the same, to appoint its officers, who shall not be members of said corporation, and to fix their compensation and their tenure of office; and said corporation may provide for the appointment of an advisory board, and for election by the Alumni of said University to fill any vacancies in said board.

SECTION 4. The number of members of said corporation shall not be less than seven nor more than nine, and any vacancy therein may be filled by the remaining members at a meeting duly called and notified therefor; and when any member thereof shall, by reason of infirmity or otherwise, become incapable, in the judgment of the remaining members, of discharging the duties of his office, or shall neglect or refuse to perform the same, he may be removed and another be elected to fill his place, by the remaining members, at a meeting duly called and notified for that purpose.

SECTION 5. This Act shall take effect upon its passage.

House of Representatives, March 30, 1887, Passed to be Enacted.

CHARLES J. NOYES, *Speaker.*

Senate, March 31, 1887, Passed to be Enacted.

HALSEY J. BOARDMAN, *President.*

During the previous five years, Mr. Clark had gradually acquired a tract of land comprising over eight acres, located on Main street, about a mile from the heart of the city, with additional tracts near by. This land has considerable elevation above that part of the city, is a watershed sloping to the south-east, ensuring sanitary excellence and a wide and picturesque view. A park reservation of about 25 acres, directly opposite, has been set apart by the city, and named University Park.

CENTRAL BUILDING.

Plans for a main building were submitted to the Board by Mr. Clark, which were approved, and its erection was at once begun. The corner-stone was laid with impressive ceremonies, Oct. 22, 1887. The building is plain, substantial and well appointed, 204x114 feet, four stories high and five in the centre, with superior facilities for heating, lighting and ventilation, and has been constructed of brick and granite, and finished throughout in oak.

The following year a Chemical Building was planned and erected.

The foundations of another department building are laid.

On April 3d, 1888, G. STANLEY HALL, then a professor at Johns Hopkins University, was invited to the presidency. The official letter conveying this invitation contained the following well-considered and significant expression of the spirit animating the Trustees :

“They desire to impose on you no trammels ; they have no friends for whom they wish to provide at the expense of the interests of the institution ; no pet theories to press upon you in derogation of your judgment ; no sectarian tests to apply ; no guarantees to require, save such as are implied by your acceptance of this trust. Their single desire is to fit men for the highest duties of life, and to that end, that this institution, in whatever branches of sound learning it may find itself engaged, may be a leader and a light.”

This invitation was accepted May 1st, and the President was at once granted one year's leave of absence, with full salary, to visit universities in Europe. This year was dili-



gently improved in gathering educational literature and collecting information and advice from leading authorities, a report of which will probably be made later. Upon his return in April, 1889, it was unanimously voted to begin the University in five scientific departments, as follows: Mathematics, Physics, Chemistry, Biology and Psychology. It was also determined that the work of these departments should be, for the present, advanced or post-graduate work only.

In accordance with these provisions, instructors were engaged, announcements issued, apparatus and books ordered, and rooms equipped. Formal opening exercises were held on Oct. 22,* in the large hall of the University, and the work of instruction in these departments was at once begun.

DESCRIPTION OF BUILDINGS.

THE BUILDINGS are situated on a lawn of about eight acres with a frontage of 800 feet on Main street. The location is high and the building is placed on the most elevated point of ground and commands an extensive view over the city and the surrounding hills. The location of the buildings is shown in the following plan.



1. CENTRAL BUILDING. 2. CHEMICAL BUILDING.

The elevations of the Central Building and the floors of both are shown in the accompanying sketches.

*The proceedings and addresses on this occasion are printed in a pamphlet entitled, "Opening Exercises of Clark University."

CENTRAL BUILDING.

The plans of the first and central building of the University are the result of long observation and study and careful consultation with the leaders of education in both Europe and America. Its characteristic features are utility and solidity, and the aim has been to produce a model structure in all that relates to light, ventilation, sanitary arrangements, and acoustic properties.

The structure shows a general front of three stories high above the solid granite base of seventeen feet and the middle section has a fourth story which carries a clock tower. At each end is a projection in the shape of a tower rising one story above the general level of the roof. The base story which at the front is entirely above the ground is laid up in bold rock faced granite ashler, capped with a cut granite water table belt. The main entrance is recessed under a granite archway 11 feet wide and 14 feet high. Over this is a granite balcony. Three special entrances to the right of the main entrance, one to the left leading into the gymnasium, and still another in the east end tower have been provided. The entrance from Woodland street is in all respects similar to that on the Main street side. Above the water table the building is constructed of Philadelphia pressed brick, with granite trimmings. Three large granite tablets on the central part of the front bear the inscription CLARK UNIVERSITY 1887.

The extreme length of the building is $204\frac{1}{2}$ feet, and its extreme width 114 feet. The height of the rooms are 17-16-14-12 feet in the clear.

WALLS, FLOORS AND FINISH.

The outer walls are two feet thick, and are of brick laid hollow, the plaster being laid directly on the brick with no outside furring. A large portion of the partitions are entirely of brick. The building has thus been constructed with a general view to fire-resisting qualities although it is not claimed to be fire proof. There is a stand pipe at each end of the building with hose attached in the hall of each story. Where the partition walls are not of brick two independent partitions with an air chamber between divide the several lecture rooms for the purpose of deadening the sound, and are further improved by felting and asbestos linings. The same precautions have been taken with the floors, two thicknesses of deadening paper having been used in addition to the air spaces of 14 inches between the floors and the ceilings. The inner walls of the first floor are of pressed brick throughout the building. The doors, casings and wainscotings ($5\frac{1}{2}$ feet high throughout both the main halls and $3\frac{1}{2}$ feet in all the other rooms) are of Indiana white oak. All the floors are of rock maple and black birch. All water closets, bowls and basins above the first floor are located in the towers at either end of the building. The plumbing throughout is of the best style of modern workmanship.

ROOMS.

In the south, the first floor is the gymnasium (No. 3). This room is 96 feet in length, 64 feet in width and 17 feet in height. It has a special entrance in the south-west corner and it also connects with the main



Scale, one inch=about 53 feet.

Dimensions of Building, 204 x 114 feet.

FIRST FLOOR.

entrance. Adjoining the gymnasium are two large rooms (Nos. 5 and 6.) To the right of the main entrance are five connecting rooms (Nos. 11 to 15.) One of these (15) is fitted up as a machine shop and the other four are special research rooms of the Physics department. Back of these rooms are the boiler room, (No. 9) engine and dynamo room (No. 7), and a room for the storage battery cells (No. 8).

The Main street entrance opens into a vestibule 14x17 feet, from which the stairway, 12 feet wide, leads to the main corridors of the upper stories. Directly opposite the head of the stairs is a corridor leading to the Woodland street entrance. On either side of this corridor are two store rooms each 13x24 feet. (Nos. 18-53).

Running longitudinally through the middle of the building is a corridor 14 feet wide, terminating in the towers at either end, which have stairways leading to the several stories. In the central section of the Main street front is the Library (Nos. 31 and 32) 32x44 feet, and adjoining it the Reading Room (No. 35) and the Faculty Room (No. 36), each of which are 21x40 feet.

In the southwest end of this floor are the rooms (Nos. 37 to 40) of the President, and the University Office. The Psycho Physical (No. 51) and Neurological (No. 52) laboratories with their adjoining rooms for the instructors in these departments.

In the northeast are three rooms (Nos. 26-28-30), each 21x40, devoted to the purposes of the Physics department, one (No. 30) as a lecture



room, the other two as private research rooms. There is also a large lecture hall (Nos. 19-21) 40x65 feet. The rooms on this floor are 14 feet high.

The third story is reached by a double flight of stairs, each section 8 feet wide, leading to a landing 8x30 feet, and from this by a single flight, 12 feet wide, to the floor.

This floor has the longitudinal corridor as below, and eight private rooms (Nos. 59 to 62 and 67 to 70) for the instructors at the west end. It also contains the Mathematical (Nos. 57-58) and Biological (Nos. 71 72) lecture rooms, the Morphological (Nos. 73-74-75) and Anatomical

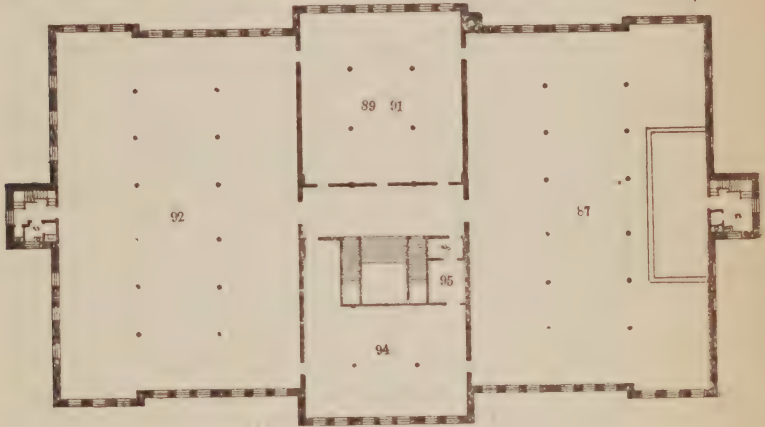


THIRD FLOOR.

(Nos. 76-77) laboratories, (each of which is 44 feet square), Anthro-

logical laboratory (Nos. 55-56) immediately over and corresponding in size to the library on the floor below, a room, (No. 78) 21x40, fitted up as a Meteorological laboratory, a room (No. 82) fitted up for the department of Osteology and Paleontology, and several other offices and rooms.

At each end of the fourth floor is a large lecture hall 65x100 feet and 16 feet in the clear (Nos. 87-92). The two rooms on the north and south of this floor are fitted up, that on the north (Nos. 89 to 91) for Animal Physiology and that on the south (Nos. 94 to 96) for Human Physiology. Each of these laboratories is 32x44 feet.



FOURTH FLOOR.



FIFTH FLOOR.

The central portion of the building is carried up another story and is reached by two flights of stairs leading into a hall or gallery (Nos. 97-

98) 44 x 80 feet and with a dome light 12 x 40. Adjoining this hall are two smaller rooms, from which a flight of stairs leads up to two large and well-lighted store-rooms.

HEATING.

The boiler-room, where the steam heating apparatus is located, is arched over with brick and iron girders, making the room absolutely fire proof. The low pressure gravity system is employed, and all pipes are graded away from the boilers, so that the condensed steam is carried by its own weight. The two large boilers are of 110 horse-power each. They are 6 x 17 feet in size, with 16 feet tubes, $3\frac{1}{2}$ inches in diameter. The boilers stand side by side, and are connected at the top by a drum. They are so arranged as to be run together or separately. The apparatus is divided into five systems, so that by means of valves in the distributing pipes heat can be cut off at the boilers from any given section of the building. Each system can be used separately or all can be run together, so that any one or more of the five sections of the building can be heated independently.

From the drum, which connects the two boilers, a 10-inch distributing pipe runs, and from this are two branch pipes, one eight inches and the other six inches in diameter. The six inch pipe supplies heat for the northerly end of the building, and the eight inch pipe, with its various branches, heats the central and southerly sections. From this pipe and at right angles with it are 6 inch branches running from the front to the rear, and then along the sides of the building. From it also extend 2 $\frac{1}{2}$ inch branches through the center of the building. At various points along these pipes risers run to the floors above, and from each riser steam is taken off for radiators on each floor. At the bottom of each riser and at every low point is a drip pipe connecting with the return pipes on the ground, which convey the water back to the boiler to be again converted into steam. This method of carrying off the water prevents the disagreeable snapping, common to steam apparatus, caused by the steam being forced against condensed water in the pipes.

A double system of heating has been adopted, running the pipes to every room, so that the chill can be taken off the building very quickly. Thirty air chambers are placed on the first floor, where cold air is brought directly over the stacks, and fresh air is carried all over the building. No one of the air chambers connects with more than one room. The air, after entering the chambers, strikes perforated discs, through which it is distributed evenly through the radiators.

LIGHTING.

Following the models of such institutions both in this country and in Europe, every room in the building receives only a direct light. All cross lights are studiously avoided, the windows and seats all being

arranged so that the light will be received at the back or the side of the students. The number, size and arrangement of the windows give an abundance of direct light to every room in the building.

There are in all about 250 windows with large paned and first quality German sheet glass and all are carried to the ceiling so that the greatest amount of light is obtained for the given surface of glass. The matter of obtaining a direct light has been accomplished without detriment to the general design of the building.

VENTILATION.

The fact that all the windows reach to the ceiling aids of course to secure good ventilation and there is besides a ventilating flue to every four feet of wall.

The entire first floor is ventilated by the flue, $2 \times 2\frac{1}{2}$ feet, which surrounds the steam chimney, and into which are openings on each floor.

The flat roofs are elevated about three feet above the ceilings, leaving an air space inside for the purpose of giving a draft of air to guard against variations of temperature. This space is ventilated by apparatus in the wall which can be opened or closed from the rooms below.

A summary statement of the size of the rooms may be made as follows:

The MAIN BUILDING contains

	3 rooms	65x100 feet	
1	"	44x80	"
2	"	40x65	"
2	"	44x44	"
3	"	31x32	"
14	"	21x40	"

and also sixty-five smaller rooms, making a total of 90 rooms and 101 numbers.

CHEMICAL BUILDING.

The chemical building is constructed throughout of brick. The main body of the building has three stories, its southwestern wing has two stories, each 22 feet in the clear. Its facilities for heating and ventilation are substantially the same as those of the main building. The outer walls are 2 feet in thickness, and the partition walls from 12 to 16 inches. All partitions are of brick, so that the building is nearly fire-proof. There are two main laboratories, 24×58 , and 22 feet high.

FIRST FLOOR.

- | | | | |
|----|---------------|----|-----------------------|
| 17 | Furnace Room. | 23 | Crystallization Room. |
| 10 | Boiler Room. | 16 | Steam Room. |
| 3 | Store Room. | 8 | Coal. |



Dimensions of Building, 134 feet 8 inches x 135 feet. Scale, 1 inch = about 34.10 feet.

SECOND FLOOR.

- | | | | |
|-------|---------------|----|------------------|
| 26 | Lecture Room. | 28 | Balance Room. |
| 32-33 | Store Rooms. | 34 | Main Laboratory. |

35 Combustion Room.

36-39 Crystallography — Private
Room of Dr. Williams.

41 Physical Chemistry Room—Private Room of Dr. Loeb.

45 Lecture Room.



THIRD FLOOR.

47 Professor's Private Room.

51 Microscopy and Spectral Analy-
sis.57 Private Room of Dr. Muth-
mann.

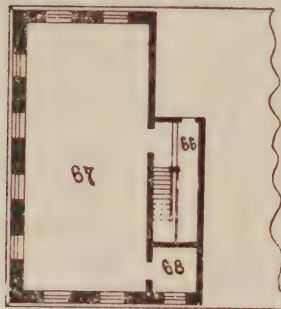
52 Dark Room.

54 Private Laboratory of Dr. Nef.

61 Chemical Library.



FOURTH FLOOR.



The CHEMICAL LABORATORY contains

2	rooms	24x58	feet	22	feet	high.
4	"	22x47	"	14	to 16	" "
3	"	26x32	"	"	"	" "
3	"	20x32	"	"	"	" "
4	"	22x24	"	"	"	" "
3	"	18x32	"	"	"	" "
3	"	16x18	"	"	"	" "
12	"	14x16	"	"	"	" "

and others varying from 12x16 and 10x22 to 6x6, making a total of 68 rooms.

REGULATIONS.

ENACTED BY THE BOARD OF TRUSTEES APRIL 11TH, 1890.

1. All requisitions for apparatus and books must be made through the University office upon printed blanks provided

for that purpose, and, except in the case of Docents, signed by a member of the staff.

2. So far as possible orders for only the kind and amount of apparatus certain to be used during the year shall be placed, nothing shall be ordered for future years, and apparatus for research shall take precedence over that of teaching and illustration only.

3. A book shall be kept for each department containing a complete list of apparatus and supplies with itemized cost. With the aid of this book a complete inventory of the stock shall be made once a year and whenever else the President shall direct.

4. Requisitions for repairs, furniture, plumbing and work about the buildings, must be made in writing and with detail and must be approved by the Building or Finance Committee or such person or persons as they may authorize. When once thus passed upon no change involving additional expense can be made in the requisitions without the consent of the Finance Committee.

5. No unappropriated rooms, and no part of the University grounds, shall be used for any purpose, and appropriated rooms shall not be used for other purposes than the stated University work for which they were intended, without previous permission from the office.

6. Unless for special reasons, absence of Instructors from their stated exercises or from town for two consecutive week days in term time, should be announced at the Office, and for longer absence permission should be obtained beforehand.

7. The Trustees desire that no Instructor, Docent or Fellow shall enter upon other engagements outside his proper work in the University of a kind or amount likely to lessen his full efficiency for science within the University.

The following additional Rules were passed by the Board of Trustees at a meeting held April 4th, 1891, to take effect for the next academic year:

8. Appropriations shall hereafter cover all apparatus and supplies of whatever nature for laboratories, for demonstration or illustration, all metal and carpenter work connected with the scientific activity of each department, and every

form of special service. Appropriations, however, shall not hereafter cover books or journals, which shall be submitted to the Library Committee.

9. The several appropriations made to individual Instructors and others shall be the full and fixed limit of the liability of the University, to be on no account transcended, and for every excess over the appropriations, from whatever cause, the Instructor making the order shall be personally responsible.

10. No order for any purpose shall be paid by the University whether on appropriations or for general supplies, that has not passed through the University Office.

PUBLICATIONS CONNECTED WITH THE UNIVERSITY.

I.—THE JOURNAL OF MORPHOLOGY.

This Journal was commenced in September, 1887, and is edited by Professor C. O. Whitman, with the co-operation of Edward Phelps Allis, Jr., of Milwaukee. From two to four numbers a year are issued, in crown octavo, of 150 to 200 pages each, with from five to ten lithographic plates. Vol. I (two numbers), \$6.00; Vol. II (three numbers), \$9.00; single numbers, \$3.50.

II.—THE AMERICAN JOURNAL OF PSYCHOLOGY.

This Journal was commenced in November, 1887, and is edited by Dr. G. Stanley Hall. Each volume contains four numbers of about 150 pages each. Besides original articles, about half its space is devoted to careful digests of the important literature in its field. Price, \$5.00 per volume; single numbers, \$1.50.

III.—The First Official Announcement was issued May 23d, 1889.

IV.—The Addresses and Exercises at the opening of the University on October 2d, 1889.

V.—Register and Second Official Announcement, May, 1890.

VI.—First Annual Report of the President to the Board of Trustees, October 4, 1890. This contains the first statement

of the plan, aims and methods of the University, and reports upon the original investigation of each department from each member who has made such.

VII.—THE PEDAGOGICAL SEMINARY.

This Journal was begun in January, 1891, and is edited by the President of the University. It is an International Record of Educational Literature, Institutions and Progress, and is devoted solely to the highest interest of Education in all grades, with digests of important literature of all countries. Each volume will probably contain 300 or 400 pages. It is the organ of the Educational Department of the University. Price, \$4.00 per volume. Single numbers, \$1.50.

INDEX.

CALENDAR,	PAGE.
	2
APPOINTMENTS.	
Staff,	3
Docents,	4
Assistants,	5
Honorary Fellows,	6
Fellows,	6
Scholars,	7
Miscellaneous,	8
ADMINISTRATION.	
Trustees,	9
President and Faculty,	10
GENERAL STATEMENTS,	12
Admission,	13
Classes of Appointees,	14
1—Docents,	14
2—Candidates for the Doctorate,	16
3 Special Students,	17
4 Medical Students,	18
5 Preliminary Candidates,	18
FELLOWSHIPS AND SCHOLARSHIPS,	19
Clark Fellowships, etc.,	20
Purpose of Fellowships,	21
Methods,	22
Notices,	23
DEPARTMENTS.	24
I—Mathematics,	25
II—Physics, Experimental and Theoretical,	31
III—Chemistry,	36
IV—Biology, including Anatomy, Physiology and } Paleontology,	41
V—Psychology, including Neurology, Anthropology, Crim- } inology, Philosophy and Pedagogics,	51
Modern Languages,	56
LIBRARY,	58
Library Rules,	65
HISTORY AND BUILDINGS,	67
Central Building,	70
Chemical Building,	77
REGULATIONS,	80
PUBLICATIONS,	82

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Fourth Official Announcement.

APRIL, 1892.

TRUSTEES.

President, - - JONAS G. CLARK.

Vice Presidents, - { WILLIAM W. RICE.
 GEORGE F. HOAR.
 THOMAS H. GAGE.

Treasurer, - - STEPHEN SALISBURY.

Secretary, - - FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark,
Stephen Salisbury, John D. Washburn,
Thomas H. Gage, Frank P. Goulding,
George F. Hoar, George Swan,
William W. Rice, Edward Cowles.

COMMITTEES.

FINANCE.

Jonas G. Clark,
Stephen Salisbury,
John D. Washburn.

BUILDINGS.

Jonas G. Clark,
Stephen Salisbury.

BY-LAWS.

Jonas G. Clark,
William W. Rice,
John D. Washburn,
Stephen Salisbury,
George Swan.

James P. Hamilton, - - Cashier.

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Fourth Official Announcement.

WORCESTER, MASS.:
PUBLISHED FOR THE UNIVERSITY.
April, 1892.

CALENDAR: 1892-93.

1892.

JUNE 16. Thursday. Present Academic year ends.

SEPT. 27. Tuesday. Fourth academic year begins.

DEC. 24. }
1893. } Christmas Recess.
JAN. 2. }

Date of the Spring Recess and close of next academic year
to be determined later.

APPOINTMENTS.

STAFF.

G. STANLEY HALL, PH. D. LL. D., President of the University.

94 Woodland St.

A. B., Williams College, 1867 and A. M., 1870; Ph. D., Harvard University, 1878; Lecturer in Harvard and Williams Colleges, 1880-1881; Professor of Psychology, Johns Hopkins University, 1881-1888; LL. D., University of Michigan, 1888; and Williams College, 1889.

ALBERT A. MICHELSON, PH. D., Professor of Physics.

96 Woodland St.

Midshipman U. S. Naval Academy, 1873; Instructor in Physics and Chemistry, U. S. Naval Academy, 1873-77; Nautical Almanac Office, Washington, 1877-79; Professor of Physics, Case School of Science, Cleveland, O., 1883-89; Honorary Ph. D., Western Reserve University, 1886, and Stevens Institute, 1887; Rumford Medals, 1888; Member of the National Academy, American Academy of Science, Corresponding Member of the British Association, and Member of American Association for the Advancement of Science.

WILLIAM E. STORY, PH. D., Professor of Mathematics. 14 May St.

A. B., Harvard University, 1871; Ph. D., Leipzig, 1875; Tutor of Mathematics, Harvard University, 1875-76; Associate, Assistant Professor, and Associate Professor of Mathematics, Johns Hopkins University, 1876-89; Member of the London Mathematical Society; Resident Fellow of the American Academy of Arts and Sciences.

C. O. WHITMAN, PH. D., Professor of Invertebrate Morphology.

936 Main St.

A. B., Bowdoin, 1868; Principal of Westford Academy, and Master of English High School, Boston, 1869-75; Ph. D., Leipzig, 1878; Fellow of Johns Hopkins University, 1879; Professor of Zoology, Imperial University of Japan, 1880-81; Naples Zoological Station, 1882; Director of the Allis Lake Laboratory, 1886-89; Director of Marine Biological Laboratory, Woods Holl, Mass., since 1887.

HENRY H. DONALDSON, PH. D., Assistant Professor of Neurology.

29 Richards St.

A. B., Yale, 1879; Sheffield Scientific School, 1880; College of Physicians and Surgeons, New York, 1881; Fellow of Johns Hopkins University, 1881-83; Ph. D., Johns Hopkins University, 1885; Associate in Psychology, Johns Hopkins University, 1887-88.

WARREN P. LOMBARD, M. D., Assistant Professor of Physiology.

17 Hammond St.

A. B., Harvard, 1878; M. D., Harvard Medical School, 1881; Leipzig, 1882-85; Assistant in Physiology, College of Physicians and Surgeons, New York, 1888.

JOHN U. NEF, PH. D., Assistant Professor of Chemistry. 5 Grout Court.

A. B., with honors in Chemistry, Harvard, 1884; Kirkland Fellow, Harvard University, 1884-86; Ph. D., Munich, 1886; Professor of Chemistry and Director of the Chemical Laboratory Purdue University, Lafayette, Ind., 1887-89.

FRANKLIN P. MALL, M. D., Adjunct Professor of Anatomy.

M. D., University of Michigan, 1883; University of Heidelberg, 1884; University of Leipzig, 1885-86; Fellow, Instructor and Associate in Pathology, Johns Hopkins University, 1886-89.

OSKAR BOLZA, PH. D., Associate in Mathematics. 12 Oread St.

Ph. D., Gottingen, 1886; Reader in Mathematics, Johns Hopkins University, 1888-89.

EDMUND C. SANFORD, PH. D., Instructor in Psychology.

21 Oread Place.

A. B., University of California, 1883; Fellow of Johns Hopkins University, 1887; Ph. D., Johns Hopkins University, 1888; Instructor in Psychology, Johns Hopkins University, 1888.

J. PLAYFAIR McMURRICH, PH. D.

Assistant Professor of Morphology. 2 King St.

A. B., University of Toronto, 1870; and Assistant in Biological Laboratory, 1880-81; M. A., 1882; Professor of Biology in the Ontario Agricultural College, Guelph, Canada, 1882-84; Instructor in Osteology, Johns Hopkins University, 1884-85; Ph. D., Johns Hopkins University, 1885; Professor of Biology at Haverford College, Pennsylvania, 1886-89; Member of Staff of Instruction, Marine Biological Laboratory, Woods Hole, Mass.

DOCENTS.

GEORGE BAUR, PH. D., Docent in Comparative Osteology
and Paleontology. 32 Maywood St.

Academy of Hohenheim, 1878-79; University of Munich, 1879-81; University of Leipzig, 1881-2; University of Munich, 1882; Ph. D., University of Munich, 1882; Assistant to Professor C. Kupffer, Munich, 1882-84; Assistant to Professor O. C. Marsh, Yale University, 1884-90.

FRANZ BOAS, PH. D., Docent in Anthropology. 210 Beacon St.

Ph. D., Kiel, 1881; Member of Expedition to the Arctic Regions, 1883-84; Docent of University of Berlin, 1885; Anthropological Researches in British Columbia and Alaska, 1886-87; and in the same territory, under the auspices of the British Association for the Advancement of Science, 1888-89.

WILLIAM H. BURNHAM, PH. D., Docent in Pedagogy.

100 Chatham St.

A. B., with honors in Philosophy, Harvard University, 1882; Instructor in Wittenberg College, 1882-83; Instructor in the State Normal School, Potsdam, N. Y., 1883-85; Fellow Johns Hopkins University, 1885-86; Ph. D., 1888, and Instructor, 1888-89.

JOSEPH DE PEROTT, Docent in Mathematics.

13 Woodland St.

Universities of Paris and Berlin, 1877-80.

HENRY TABER, PH. D., Docent in Mathematics.

2 King St.

A. B., Yale (Sheffield Scientific School) 1882; Ph. D., Johns Hopkins University, 1888; and Assistant in Mathematics, Johns Hopkins University, 1888-89. Member of the London Mathematical Society; Resident Fellow of the American Academy of Arts and Sciences.

ARTHUR G. WEBSTER, PH. D., Docent in Mathematical Physics.

3 Shepard St.

A. B., Harvard, 1885, with honors in Mathematics and Physics; Instructor in Mathematics, Harvard, 1885-89; Parker Fellow, 1889-89; Universities of Berlin, Paris, Stockholm, 1886-90; Ph. D., Berlin, 1890.

ASSISTANTS.

THADDEUS L. BOLTON, A. B., Assistant and Fellow in Psychology.

23 Benefit St.

A. B., University of Michigan, 1883; Principal Public Schools, Vulcan, Mich., 1889-90.

THOMAS H. CLARK, B. S., Worcester, Mass., Assistant in Chemistry.

22 Lancaster St.

B. S., Polytechnic Institute, Worcester, Mass., 1880; Johns Hopkins University, 1883; Assistant in Chemistry, Wesleyan University, Middletown, Conn., '80-89.

MASSUO IKUTA, PH. D., Tokio, Japan, Assistant in Chemistry.

Beaver Block, Main St.

University of Tokio, 1880-85; University of Berlin, 1889; Ph. D., University of Erlangen, 1887-88; Consulting Chemist, Tokio, 1889-90.

F. L. O. WADSWORTH, M. E., B. S., Wellington, O., Assistant in

Physics. 26 Clifton St.

E. M., State University, Columbus, O., 1888; M. E. and B. S., 1889.

S. WATASE, B. S., PH. D., Tokio, Japan, Lecturer and Assistant in

Morphology. 70 Florence St.

B. S., Sapporo, Japan, 1884; Student of Zoology, University of Tokio, 1884-86; Fellow, Johns Hopkins University, 1888-89; and Bruce Fellow, 1889-90; Ph. D., Johns Hopkins University, 1890.

GERALD M. WEST, A. M., PH. D., Assistant in Anthropology.
Hotel Prentice.

A. B., Columbia College, 1888, A. M., 1889, and Ph. D., 1890.

WILLIAM M. WHEELER, Milwaukee, Wis., Assistant in Morphology.
70 Florence St.

German-American Normal College, Milwaukee, 1883; Ward's Nat. Sci. Estab., 1883-85; Teacher of German and Assistant in Biology, Milwaukee Public High School, 1885-88; Curator, Milwaukee Public Museum, 1887-90.

HENRY S. WHITE, PH. D., Assistant in Mathematics. 6 Wyman St.

A. B., Wesleyan University, 1882; Assistant in Astronomy and Physics, Wesleyan University, 1882-83; Instructor in Mathematics at Hackettstown, N. J., 1883-84; Tutor in Mathematics, Wesleyan University, 1884-87; University of Gottingen, 1887-90; Ph. D., Gottingen, 1890.

HONORARY FELLOWS.

PURSUIING SPECIAL INVESTIGATIONS.

WALTER CHANNING, M. D., Brookline, Boston, Mass.

CHARLES L. EDWARDS, PH. D., Fellow in Morphology.
14 King St.

B. S., Lombard, 1884; B. S., The Indiana University, 1886, and A. M., 1887; Johns Hopkins University, 1887-89; Ph D., University of Leipzig, 1890.

GEORGE F. METZLER, PH. D., Odessa, Ont., Fellow in Psychology.
87 Woodland St.

A. B., Albert College, 1880; A. M., Victoria College, 1883; Head Master Port Dover High School, 1881; Professor of Mathematics, Albert College, 1881-84; Johns Hopkins University, 1884-89 and 1890-91; Professor of Mathematics, Marietta College, 1889-90.

FELLOWS.

CHARLES L. BRISTOL, B. S., M. S., Fellow in Morphology.
87 Woodland St.

B. S., University of the City of New York, 1883, M. S., 1888; Teacher of Natural Sciences, Riverview Academy, Poughkeepsie, N. Y., 1883-87; Professor of Zoology, State University of South Dakota, 1888-91.

WM. L. BRYAN, A. M., Bloomington, Ind. 23 Benefit St.

A. B., Indiana University, 1884 and A. M., 1886; Berlin University, 1886-87; Instructor, Associate and Professor of Philosophy, Indiana University, 1885 to present. Absent on leave.

Handwritten notes:
"See by Prof. W. L. Bryan (Prof. of Math., & Prof. of History & Geography) - Oct 8, 1891. Letter of notification for the above subject.
One of the above named persons is a Fellow of the Association, 11 July 1891."

A. F. CHAMBERLAIN, A. B., Toronto, Ont., Fellow in Anthropology.
722 Main St.

A. B., University of Toronto, 1886; A. M., University of Toronto, 1889; Fellow in Modern Languages University College, Toronto, 1887-90; Examiner in German, University of Toronto, 1888-91; Examiner in Modern Languages, Trinity University, Toronto, 1890-91; Fellow of the American Association for the Advancement of Science.

ALBERT C. EYCLESHYMER, B. S., Fellow in Morphology.
23 Benefit St.

Assistant in Animal Morphology, 1889 and Botany in 1890, University of Michigan; Chief Assistant to the Director of the Allis Lake Laboratory, 1890-91; B. S., University of Michigan, 1891; Fellow in Biology, Princeton, 1891.

T. PROCTOR HALL, PH. D., Fellow in Physics. 15 Clifton St.

B. A., University of Toronto, 1882; Fellow of University College, Toronto, and Assistant in Chemical Laboratory, 1883 and 1884; Science Master, Woodstock College, Woodstock, Ontario, 1885-90; M. A., Ph. D. Illinois Wesleyan University, 1888; Fellow of the Chemical Society, England.

EDWIN O. JORDAN, S. B., Auburndale, Mass., Fellow in Morphology.
70 Florence St.

S. B., Mass. Institute of Technology, 1888; Chief Assistant Biologist to the Mass. State Board of Health, 1888-90; Lecturer on Biology, Mass. Institute of Technology, 1889-90.

WILLIAM O. KROHN, PH. D., Fellow in Psychology.
75 Florence St.

A. B., Western College, 1887; Ph. D., Yale University, 1889; Instructor in Philosophy and Psychology, Western Reserve University, 1889-91; Inspecting Psychological Laboratories in German Universities, July, 1891 to Feb., 1892.

JAMES E. LEROSIGNOL, PH. D., Montreal, Canada, Fellow in Psychology. 7 Shirley St.

B. A., McGill University, 1888; Ph. D., Leipzig, 1892.

W. H. METZLER, A. B., Odessa, Ont., Canada, Fellow in Mathematics. 87 Woodland Street.

A. B., University of Toronto, 1888; Science Master, Collegiate Inst., Ingersoll, Ontario, Canada, 1889.

WM. S. MILLER, M. D., Worcester, Mass., Fellow in Anatomy.
879 Main St.

M. D., Yale Medical School, 1879; Lecturer on Microscopical Technique, Mount Holyoke College, 1887-88; Pathologist to the Worcester City Hospital, and Memorial Hospital.

E. W. SCRIPTURE, PH. D., New York City, Fellow in Psychology.
8 Downing St.

A. B., College of the City of New York, 1884, and A. M., 1890; Universities of Leipzig, Berlin and Zurich, 1888-90; Ph. D., Leipzig, 1891.

- J. W. A. YOUNG, A. M., Williamport, Pa., Fellow in Mathematics.
20 Grand St.
A. B., Bucknell University, Lewisburg, Pa., 1887, and A. M., 1890; Instructor in Mathematics, Bucknell Academy, 1887-88, Student, University of Berlin, 1888-89.
- LOUIS W. AUSTIN, A. B., Winter Park, Florida, Fellow in Physics.
722 Main St.
A. B., Middlebury College, 1889; Student, University of Strassburg, 1889-90.
- J. A. BERGSTROM, A. B., Middletown, Conn., Fellow in Psychology.
5 Gates St.
A. B., Wesleyan University, 1890.
- ADOLF BERNHARD, A. B., Stone Creek, O., Fellow in Chemistry.
70 Florence St.
A. B., Johns Hopkins University, 1889.
- JOHN L. BRIDGE, B. S., Hazardville, Conn., Fellow in Chemistry.
4 Crown St.
B. S., Wesleyan University, 1888; Assistant in Chemistry at Wesleyan University, 1889-91.
- ALEXANDER FRASER, A. B., West River, N. S., Fellow in
Psychology. 9 Shirley St.
A. B., Dalhousie College, 1889; Student at Harvard University, 1889-90.
- THOMAS F. HOLGATE, M. A., Foxboro, Ontario, Canada, Fellow in
Mathematics. 17 Freeland St.
B. A., Victoria University, Cobourg, Ont., 1884, M. A., 1889; Mathematical Master, Albert College, Belleville, Ont., 1884-90.
- LORRAIN S. HULBURT, A. M., Fellow in Mathematics.
44 Richards St.
A. B., University of Wisconsin, 1883, and A. M., 1888; Prof. of Mathematics, University of South Dakota, 1887-91; Student of Mathematics, Gottingen, Germany, 1889-90.
- JOHN I. HUTCHINSON, A. B., Auburn, Me., Fellow in Mathematics.
70 Florence St.
A. B., Bates College, 1889.
- HERBERT P. JOHNSON, A. M., Fellow in Morphology.
84 Woodland St.
A. B., with honors in Natural History, Harvard, 1889, and A. M., 1890; Assistant in Biology, Williams College, 1890-91.

FRANK R. LILLIE, B. A., Toronto, Ontario, Fellow in Morphology.
87 Woodland St.

B. A., University of Toronto, 1891; Assistant in Biology, Toronto University, 1890-91.

C. E. LINEBARGER, A. B., Chicago, Ill., Fellow in Chemistry.
9 Shirley St.

A. B., Northwestern University, Evanston, Ill., 1888; Student, Chicago Medical College, 1888-89; Universities of Tübingen and Paris, 1889-91.

W. E. LOCKWOOD, Ph. B., M. D., New Haven, Conn., Fellow in Physiology. 48 Cedar St.

Ph. B., Yale University, Sheffield Scientific School, 1883; M. D., Medical Department of Yale University, 1885; Instructor in Chemistry, Medical Department of Yale University, 1885-86; Instructor and Demonstrator in Physiology, Medical Department of Yale University, 1887-91.

A. D. MEAD, A. M., Middlebury, Vermont, Fellow in Morphology.
70 Florence St.

A. B., Middlebury College, 1890; A. M., Brown University, 1891.

CHARLES WALKER, B. C. E., M. A., Knoxville, Tenn., Fellow in Chemistry. 4 Crown St.

B. C. E. and B. App. Ch., University of Tenn., 1885, and M. A., 1886; Assistant Professor of Chemistry and Physics, University of Tenn., 1886-88; Assistant in Chemistry, U. S. Naval Academy, Annapolis Md., 1889-90.

SCHOLARS.

E. N. BROWN, B. A., Scholar in Psychology. 9 Shirley St.
B. A., Dalhousie College, 1889.

F. B. DRESSLAR, A. B., Scholar in Psychology. 23 Benefit St.

A. B., University of Indiana, 1889; Instructor in Vincennes University, 1888; Principal of High School, Princeton, Indiana, 1889-90, and Superintendent of City Schools, 1890-91.

JOHN P. FRUIT, A. M., Russellville, Ky. 84 Woodland St.

A. B., Bethel College, 1878, and A. M., 1881; Professor of Latin and Greek in Bardstown Institute, Bardstown, Ky., 1879-80; President of Liberty Female College, Glasgow, Ky., 1881-82; N. Long Professor of English in Bethel College, Russellville, Ky., 1883-92; Ewing Professor of Logic and Psychology in Bethel College, 1887-92.

N. B. HELLER, B. S., Philadelphia, Pa., Scholar in Mathematics.
49 Piedmont St.

B. S., University of Pennsylvania, 1884; Teacher of Mathematics, Boys' High School, Reading, Pa., 1887-91.

JAMES S. LEMON, A. M., Gardner, Mass. Hotel Pleasant.

A. B., Wesleyan University, 1864, A. M., 1867.

JOHN MCGOWAN, B. A., Ravenna, Ont., Scholar in Mathematics.
7 Shirley St.

B. A., University of Toronto, 1888; Fellow in Mathematics, University of Toronto, 1888-91; Examiner in Mathematics, University of Toronto.

ARVIN S. OLIN, Kansas City, Kansas. 21 Hollywood St.

Ottawa University, Ottawa, Kansas, 1877-80; University of Kansas, 1881; Teacher of Latin and Mathematics in High School, Lawrence, Kansas, 1882-83; Superintendent of Schools, Iola, Kansas, 1883-87; Professor of English and Pedagogy, Ottawa University, 1887-89; Superintendent of Schools, Kansas City, Kansas, 1890-92.

ERNEST B. SKINNER, A. B., Redfield, O., Scholar in Mathematics.
11 Kilby St.

A. B., Ohio University, 1888; Professor of Mathematics, Amity College, College Springs, Ia. 1888-91.

WARREN R. SMITH, A. B., Litchfield Corners, Me., Scholar in Chemistry. 1 Lowell St.

A. B., Bowdoin, 1890.

CLERK OF THE UNIVERSITY.

LOUIS N. WILSON, 11 Shirley St.

ADMINISTRATION.

The Trustees are the ultimate source of authority in all matters pertaining to the University. They act collectively, through the three committees named below, and also through the President of the University.

BOARD OF TRUSTEES.

JONAS G. CLARK,

STEPHEN SALISBURY,
GEORGE F. HOAR,
WILLIAM W. RICE,
EDWARD COWLES,

JOHN D. WASHBURN,
FRANK P. GOULDING,
GEORGE SWAN,
THOMAS H. GAGE.

OFFICERS.

President,	- - -	JONAS G. CLARK.
Vice Presidents,	-	{ GEORGE F. HOAR, WILLIAM W. RICE.
Treasurer,		STEPHEN SALISBURY.
Secretary,	- - -	FRANK P. GOULDING.

COMMITTEES.

Finance.

JONAS G. CLARK,	STEPHEN SALISBURY.
-----------------	--------------------

Buildings.

JONAS G. CLARK,	JOHN D. WASHBURN.
-----------------	-------------------

By-Laws.

JONAS G. CLARK,	STEPHEN SALISBURY,
WILLIAM W. RICE,	GEORGE SWAN.
JOHN D. WASHBURN,	

PRESIDENT,
(*G. Stanley Hall.*)

The duties of this office were defined by the Trustees, May 23, 1889, as follows :

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University and attend the meetings of the board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

These duties were more fully defined by By-Laws enacted by the corporation, September 26, 1889.

FACULTY.

By action of the Trustees the Faculty Staff has been organized as follows :

I. UNIVERSITY SENATE.

Whose duty it is to elect Fellows and to take action upon general requirements for the Doctor's degree and other promotions, and to act and advise upon matters officially submitted to them.

II. GENERAL FACULTY.

Whose duty it is to consider all matters not otherwise provided for, and in which all departments of the University are alike interested.

III. THE BIOLOGICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Biology and Psychology.

IV. THE PHYSICAL-MATHEMATICAL FACULTY.

Whose duty it is to consider in detail the requirements for admission and degrees in the departments of Physics, Chemistry and Mathematics.

V. THE LIBRARY COMMITTEE.

To be appointed by the President or Trustees, the duty of which shall be to advise concerning the arrangement, cataloguing and use of books and other matters pertaining to the library not reserved to the Trustees or otherwise provided for.

GENERAL STATEMENTS.

The University now consists of a group of five closely related departments in which all its work and that of the above Instructors, Fellows, and Scholars is grouped. These departments are as follows :

- I. MATHEMATICS.
- II. PHYSICS, Experimental and Theoretical.
- III. CHEMISTRY, Organic, Inorganic, Physical, and Crystallography.
- IV. BIOLOGY, including Anatomy, Physiology and Paleontology.
- V. PSYCHOLOGY, including Neurology, Anthropology, Criminology, and History of Philosophy.

In addition to these modern languages are taught in a way to meet the practical needs of students in these departments.

To express more explicitly the character and policy of the institution, the Trustees have voted to approve and publish the following statement.

“ As the work of the University increases, its settled policy shall be always, to first strengthen departments already established until they are as thorough, as advanced, as special, and as efficient as possible, before proceeding to the establishment of new ones.”

“ When this is done and new departments are established, those shall always be chosen first which are scientifically most closely related to departments already established ; that the body of sciences here represented may be kept vigorous and compact, and that the strength of the University may always rest, not upon the number of subjects, nor the breadth or length of its curriculum, but upon its thoroughness and its unity.”

“ This shall in no wise hinder the establishment by other donors than the founder, of other and more independent departments if approved by the Trustees.”

“ While ability in teaching shall be held of great importance, the leading consideration in all engagements, reappointments and promotions shall be the quality and quantity of successful investigation.”

In focusing its means and care to make each of the above departments the best possible, the Uni-

versity now offers an extension of the elective system to institutions, believing that if this larger option should establish a habit of inter-university migration our higher institutions would be stimulated, and that thus they may be brought to represent the higher educational needs of the country.

ADMISSION.

Only graduate students are admitted, or those of equivalent attainments, unless in rare and special cases. At present no entrance examinations are required, but, by testimonials, diplomas, personal interviews or written specimens of work, the authorities must be satisfied that the applicant has scholarship enough to work to advantage, and zeal and ability enough to devote himself to his chosen field. The methods of the University are too costly, and its energy and funds too precious to be spent upon men who are not well trained, promising, and in earnest.

It is highly desirable, and will probably before long be required, that candidates entering any of the five departments should have, besides a knowledge of the other subjects commonly taught in colleges, a reading knowledge of French and German.

For the select students who are received, it is

the purpose of the University to open all its privileges, and to supply every incentive possible in the way of books, facilities, and, above all, direct personal stimulus and instruction. The chief as well as the best work of this University is individual, and involves daily suggestion, encouragement and direction.

CLASSES OF APPOINTEES.

No clearly marked line exists between students and instructors. Fellows and scholars who have attained some degree of mastery in a special line of work give brief special courses, which are often attended by professors. This is a stimulus to the student, and both tests and exhibits his power in teaching. This, and the custom of instructors to attend each other's lectures, has added interest and efficiency to the work of the University during the year.

I. DOCENTS.

The highest annual appointment is that of Docent. These positions are primarily honors and are reserved for a few men whose work has already marked a distinct advance beyond the Doctorate and who wish to engage in research. They are not assistants and their relations are directly with the President of the University.

Docents may be provided with individual rooms, and special apparatus may be purchased for their work if desired and approved. While they will be expected to deliver a limited number of lectures on some special chapter of their department, their time will be mainly reserved for study and research in a way best adapted to qualify them still more fully for academic advancement.

These positions are now official appointments. Appointees or others found worthy however, may be formally invested with the *licentia docendi*, the terms of which can now be furnished on application and which requires a memoir or essay representing original work in their own department, but no examination. This highest formal academic honor will be strictly reserved for those of marked scientific attainment and teaching ability and so far as this diploma can have the significance of a title or degree it will be regarded by the University as a brevet collegiate Professorship.

It is believed that by the existence of such a select body of men of guaranteed scientific training, ability and approved power to teach, the difficulties under which college trustees sometimes succumb in selecting suitable men for their professors may be diminished, and that otherwise this

new grade will aid in raising standards of academic scholarship in colleges and in encouraging scientific research here.

Good men of this class are desired by the University above all others and may be paid a salary.

II. CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

In most cases it is probable that three or at least two years of graduate work will be necessary for this degree. Examinations for it, however, may be taken at any time when, in the judgment of the University authorities, the candidate is prepared. A pre-arranged period of serious work at the University itself is indispensable.

For this degree the first requirement is a thesis upon an approved subject to which it must be an original contribution of value. To this capital importance is attached. It must be reported on in writing by the chief instructor, printed at the expense of the candidate, and at least 100 copies given to the University. In case, however, of theses of very unusual length, or containing plates of unusual expensiveness, the academic senate shall have power, at the request of the candidate, to reduce this number of presentation copies to 50. Each of these copies shall bear upon it in

print, the statement of the chief instructor, that it is a thesis for the Doctor's degree in his department at Clark University.

Such formal or informal tests as the academic senate shall determine shall mark the acceptance of each Student or Fellow as a candidate for this degree.

One object of this preliminary test shall be to insure a good reading knowledge of French and German. Such formal candidature shall precede by not less than three months and not more than one year the examination itself, and the nature and result of this test shall be made matter of record.

The fee for the Doctor's degree is \$25 and in every case it must be paid and the presentation copies of the thesis must be in the hands of the Librarian before the diploma is given. In exceptional cases, however, and by special action of the senate, the ceremony of promotion may precede the presentation of the printed copies of the thesis. The latter, however, must always precede the actual presentation of the diploma.

An oral, but not a written examination is required upon at least one minor subject in addition to the major, before an examination jury, com-

posed of at least four members, including the head of the department and the President of the University, who is authorized to invite any person from within or without the University to be present and to ask questions. The jury shall report the results of the examination to the senate, who, if they are also satisfied, may recommend the candidate for the degree.

For the bestowal of this degree, the approbation of the Board of Trustees must in each case be obtained. They desire that the standard requirements for it be kept the highest practicable, that it be reserved for men of superior ability and attainment only, and that its value here be never suffered to depreciate.

It is to the needs of these students that the lectures, seminars, laboratories, collections of books, apparatus, etc., are specially shaped and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the Fellowships and Scholarships are primarily intended, although any of these honors may be awarded to others.

III. SPECIAL STUDENTS NOT CANDIDATES FOR A DEGREE.

Any one desiring to undertake a special and approved line of research and whose attainments

are such as to satisfy the requirements of the University may also be received. This class includes those who may desire to devote themselves exclusively to one or more of the special branches — mathematics, physics, chemistry, biology or psychology — but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of the departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects) may be allowed entire freedom in their choice and combination of studies, and as special students, may enjoy all the privileges of the University.

These students may, with the approval of the President, be received for less than an entire year.

IV. PRELIMINARY CANDIDATES.

Non-university students of less special, or less advanced standing than the above four classes, who are nearly, but not quite, qualified to become candidates for the degree of Doctor of Philosophy, may also be received.

Students of this class must for the present have completed the work of the first three years of a

regular under-graduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University of their attainments and that they contemplate advancing to a degree higher than that of A. B. The privileges and status of these students will be more fully defined later. They may in exceptional cases be elected to Scholarships.

FELLOWSHIPS AND SCHOLARSHIPS.

To no form of educational gift or bequest have probably so many people contributed as to the various forms of individual aid to meritorious students.

Under the names of bursaries, stipends, exhibitions, prizes, benefices, etc., as well as of scholarships and fellowships, the revenues of foundations established by and bearing the names of sometimes thousands of donors, are annually distributed.

Sometimes these funds were given by men or women themselves not far removed from need, and are appointed to furnish a student with firewood, a room, a bed, one daily meal, or a coat each year, etc., and sometimes yield one or two thousand dollars to a single holder. Often many students were provided by a single donor, and

some of these European foundations, even the smallest, are centuries old, so sacredly are they guarded, and they were never so rapidly increasing as now.

The more advanced the education the more such aids are needed, and the more numerous and substantial do they in fact become in Europe.

So great is now the need of bringing the best intellects to fullest maturity, and so increasingly necessary for the highest scientific attainment are now the leisure, tranquility, books and apparatus thus best supplied, that the demand is strong for still more and greater aids of this kind for advanced and competent students.

Several of the wisest governments in Europe, recognizing that the modern world and its rulers are ruled by experts thus best trained, vie with private munificence in supplying such aids.

THE CLARK FELLOWSHIPS AND SCHOLARSHIPS.

With a deep sense of the peculiar needs of our country in this respect, the founder of this University and his wife have provided such opportunity and incentive here for thirty meritorious students which will be available for the next academic year as follows :

10 Fellowships of \$600 per year.

10 Fellowships of \$400 per year.

10 Scholarships of \$200 per year.

In general these appointments may perhaps represent the successive stages of approximation to the Doctor's degree, the highest priced Fellowships being for men within a year of that degree, the next for those within two years of it. Those who have already taken the Doctor's degree or those not intending to do so may be appointed to Fellowships and Scholarships. *The tuition fee which is included in the above sums will be deducted.*

The founder of the University and his wife unite with the Trustees and President in inviting sympathy and practical co-operation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

A CITIZEN'S FUND.

In addition to this a citizen of Worcester has given a fund of \$5000, the income of which is to be used for the aid of "some one or more worthy native born citizens of the city of Worcester who may desire to avail themselves of the advantages of the institution."

THE FIELD FUND.

Mrs. Eliza W. Field has also given \$500, to be called the "John White Field Fund," the income of which is "to provide for the minor needs of a Scholar or Fellow."

PURPOSE AND CONDITIONS OF FELLOWSHIPS.

Fellowships at Clark University are intended for young men of promise who desire to pursue post-graduate studies in order to fit themselves for intellectual careers. It is desirable, but not required, that candidates for these positions should intend to proceed to the degree of Doctor of Philosophy or to equivalent attainments. In general those intending to represent some special branch of learning are preferred to those directly fitting themselves for one of the three learned professions, although the latter are not excluded.

Applications should state the candidate's course of study and be accompanied by testimonials or diplomas, should indicate a decided preference for some special department and if possible be accompanied by some specimen of his work for the aid of the Board of Selection. Applications will be considered in June and in October and should be in the hands of the President on or before the first of these months. In special cases vacancies

may be filled by appointments at any time during the year. The names of unsuccessful candidates will not be made public.

Fellows must reside in Worcester during the academic year and devote themselves to special studies under the direction of their instructors and give such evidence of progress or proficiency before the end of the year as the authorities shall require. They must co-operate in promoting harmony, order and all the ends of the University, must not teach elsewhere and may be reappointed at the end of the year. Because intended primarily as honors, both Fellowships and Scholarships are awarded without reference to pecuniary needs, so that those able and desiring to do so may relinquish the emolument and retain the title of "Scholar" or "Fellow."

Both Scholarships and Fellowships are open only to students in one or more of the five departments announced.

METHODS.

Beside field work, excursions to institutions public and private, coaching and cram-classes, clubs, examinations, conferences and other modes by which knowledge now seems best imparted

and retained, the following educational methods will be prominent :

LECTURES. The Trustees desire that each instructor of however few students, should prepare and deliver regular lectures, with diagrams, illustrative apparatus and references to standard text books, and the best current literature upon each topic. Advanced students and instructors will also be encouraged to supplement the work of the professors by giving occasional special lectures and courses. Public lectures will from time to time be given.

SEMINARIES. These are stated, perhaps weekly, meetings, often in a department library, for joint, systematic, but conversational work, under the personal direction of the professor, in some special chapter of his subject. Here the results of individual reading are reported for the benefit of all ; views are freely criticised ; new inquiries, methods, comparisons, standpoints, etc., suggested. From the mutual stimulus thus given many important works have proceeded, and the efficiency of universities, especially in Germany where seminars were first generally introduced, has been greatly increased.

LABORATORY WORK. For beginners this was

from the first the best of all forms of apprenticeship, bringing student and professor to a far closer and mutually stimulating relation. Here the manipulation of apparatus is learned, each well-chosen piece of which is an obvious epitome of long lines of research; processes are criticised, results obtained by other investigators are tested, methods discussed and perfected. The modern laboratory has thus become an unexcelled school of logical mental discipline from which is developed as its best product, that rare independence in research which is the consummation of scientific culture.

NOTICES.

The charge for tuition, giving all the privileges of the University, but not covering the laboratory fees is \$200 per annum; but special arrangements may be made with individuals who are not under appointment as Scholars or Fellows.

The fee for students of the educational department alone is \$50, with \$10 additional for the work of each additional instructor.

Board and lodging can be obtained near the University at very moderate rates.

Further announcements will be made from time to time during the summer.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk of the University, Worcester, Mass.

DEPARTMENTS.

The statements of the instructors concerning the courses given during the academic year 1891-92, which follow, are supplemented by announcements of the work to be done during the academic year 1892-93, so far as can be done at the date of issue.

Further announcements for Docents as well as the work for new Instructors who may be appointed before the beginning of the next academic year will be made later.

I.

MATHEMATICS.

During the academic year 1891-2 instruction was given by

W. E. STORY, Ph. D., Professor of Mathematics.

O. BOLZA, Ph. D., Associate in Mathematics.

J. DE PEROTT, Docent in Mathematics.

H. TABER, Ph. D., Docent in Mathematics.

H. S. WHITE, Ph. D., Assistant in Mathematics.

The facilities for the study of the higher mathematics offered by this University are unsurpassed in this country. The library is already provided with most of the standard works in the various branches of mathematics, including textbooks, monographs, collected works of the great mathematicians, historical works, and complete sets of the more important journals and transactions of learned societies. The department also possesses full sets of Brill's models of geometrical surfaces and curves and of Björling's thread-models of developable surfaces, Amsler's planimeter, Thomas' Arithmometer, etc. These collections will be supplemented by such books and apparatus as may, from time to time, appear desirable.

The courses of instruction in mathematics are arranged primarily for those students who intend to become candidates for the degree of Doctor of Philosophy ; but special students properly qualified will be received, admitted to the lectures, and guided in such particular lines of work as they may elect.

The department is also prepared to direct and assist those who have already taken the degree of Doctor of Philosophy and who desire to continue their studies with the intention of ultimately becoming professors of the higher mathematics.

The requisites for admission are a good working knowledge of

Differential and Integral Calculus,
Plane Analytic Geometry, through Conic Sections,
Solid Analytic Geometry, through Quadric Surfaces,
Elements of the Theory of Algebraic Equations.

A knowledge of the theory of Determinants and their application to the solution of linear equations, and of Differential Equations is desirable.

The aim of the department is to make each student

1. Familiar with the general scope and characteristic methods of all the principal branches of mathematics;
2. Conversant with the details of a few branches as far as they are given in the best text books;
3. Acquainted with the entire literature of one or more special topics, especially with monographs and periodical articles; and
4. Trained in independent investigation.

These several objects are accomplished by means of *introductory*, *advanced* and *special* courses of instruction, and *seminary exercises*. The work for the doctor's degree will ordinarily require three years for its completion.

INTRODUCTORY COURSES.

Each student is expected to make himself familiar with the fundamental principles and methods of the following branches during his first two years at the University, in so far as he has not already mastered them :

Theory of Numbers,
Modern Higher Algebra,
Higher Plane Curves (analytical theory),
General (analytical) theory of Twisted Curves and Surfaces,
Quaternions,

Finite Differences and Interpolation,
 Probabilities and the method of Least Squares,
 Modern Synthetic Geometry,
 Definite Integrals,
 Differential Equations,
 Calculus of Variations,
 Elliptic Functions,
 General Theory of Functions.

The requisite knowledge of these subjects may be acquired by private study, by attendance on Introductory Courses of lectures, or by attendance on more complete courses in which the elements are included. Courses of one kind or the other in most of the subjects will be given each year.

ADVANCED AND SPECIAL COURSES.

In the Advanced Courses broad subjects are treated more extensively than in the Introductory Courses, while Special Courses deal with particular topics or sections of broad subjects. These courses vary from year to year, but advanced courses in the most important subjects will be given every few years. Students will be directed in reading privately subjects not regularly announced.

The following subjects, in which the University offers peculiar facilities at present, are suggested for prolonged study (advanced courses) :

MODERN ALGEBRA, including the theory of invariants and higher parts of the theory of equations;

ANALYTIC GEOMETRY, including higher plane curves, twisted curves, surfaces, noneuclidean geometry and hyperspace;

MODERN SYNTHETIC GEOMETRY, plane and solid;

THEORY OF NUMBERS;

THEORY OF FUNCTIONS, including elliptic and abelian functions;

EXTENSIVE ALGEBRA, including quaternions, the "Ausdehnungslehre," and multiple algebra in general.

Instruction is given by lectures, by directed courses of reading, and by guidance in original investigation. While the Introductory Courses are given mostly by lectures, the student is expected to do such collateral reading in connection with the Advanced and Special Courses as may be suggested by the lecturer. Each student selects some subject as a specialty; he is then placed under the immediate guidance of one of the instructors, who will direct his studies in the chosen subject, will advise him in the choice of a topic for special investigation, and will give such assistance in carrying on this investigation as may be necessary. The results of this research must be embodied in a thesis, which will ordinarily be the basis of an application for the degree of Doctor of Philosophy.

There will be weekly Conferences, at which mathematical literature will be reviewed and the results of original investigations of instructors and students discussed. Books and articles in the various journals will be assigned to the students for review at these meetings,

The chief aim of the department is to make every student an investigator in some branch of mathematics, pure or applied, and it is believed that personal guidance is as necessary in this direction as in the acquisition of knowledge.

WORK OF THE CURRENT YEAR 1891-2.

PROFESSOR STORY.

Professor Story has given the following courses of lectures :

1. THE HISTORY OF ARITHMETIC AND ALGEBRA, with details of the notations and methods employed by the ancient Egyptians, Chaldeans, Greeks, Hindus, Hebrews, Saracens and others, in so far as material for such details was available; particular attention was paid to the influences that may have been exerted by the ancient systems on those of later times.

Some time was spent on mechanical appliances for computation, e. g. the abacus of the Greeks, Romans, Russians, Chinese and Japanese, calculating machines, and mechanical integrators. Once a week throughout the year.

2. SOME TOPICS OF ANALYSIS SITUS, with special reference to the connectedness of surfaces, polyedra, and coloring of maps with the smallest possible number of colors. Twice a week during the first half-year.

3. MODERN ALGEBRA; an advanced course on the covariants and invariants of systems of quantics involving any number of variables, their conditions, numbers, and syzygies. The writings of Cayley, Sylvester, and Hilbert formed the basis for this course, from which the symbolic methods of Aronhold, Gordan, and Clebsch were necessarily excluded. The lecturer presented also the results of his own recent investigations. Twice a week from January to March and weekly during the rest of the year.

4. ALGEBRAIC PLANE CURVES OF THE FOURTH AND HIGHER ORDERS; the possible forms of such curves, their branches, singularities, and particularly the distribution of their bitangents and inflexions. Twice a week during the second half-year.

Professor Story has also conducted weekly two-hour meetings of the mathematical department. The objects of these meetings are:

(a) The systematic discussion of methods by which special topics have been or may be treated;

(b) The presentation of synopses and criticisms of important and novel investigations (especially current literature);

(c) The communication of the results of original research by members of the University.

Among the topics considered during the current year may be mentioned:

The treatment of parallel lines by Euclid, Legendre, Lobatchefsky, Bolyai, the authors of modern text-books of elementary geometry, and writers on noneuclidean geometry,—to which about eight sessions were devoted;

Hilbert's investigations on algebraic forms;

Cantor's hyperinfinite number-system;

Hilbert's researches on the possible real branches of algebraic plane curves;

The invariants of differential equations;

Models illustrating rotation in 4-fold space;

Mechanical appliances for performing certain mathematical operations;
 Certain properties of symmetric, skew-symmetric and orthogonal matrices.

DR. BOLZA.

Dr. Bolza has lectured on the following subjects :

1. DEFINITE INTEGRALS (Introductory Course); general theory of simple definite integrals, Euler's integrals, Fourier's series, double integrals, line-integrals.

2. ELLIPTIC FUNCTIONS (Introductory Course); elements of the theory according to Legendre, Abel and Jacobi, with applications to geometry and mechanics.

3. CALCULUS OF VARIATIONS; maxima and minima of simple definite integrals involving one unknown function, second variation, Jacobi's criterion, isoperimetric problems, extension to several unknown functions and double integrals.

4. THEORY OF FUNCTIONS (Introductory Course); extension of algebraic operations to complex quantities, monogenic functions and orthomorphic transformation, applications to mathematical physics, many-valued functions and Riemann's surfaces, Cauchy's theory of definite integrals between complex limits, Taylor's series.

These four introductory courses together occupied three hours a week throughout the year.

5. KLEIN'S ICOSAEDRON-THEORY, finite groups of rotations, the corresponding groups of linear substitutions, rational automorphic functions. Twice a week until March 1.

MR. DE PEROTT.

Mr. de Perott has lectured on the following subjects :

1. THEORY OF NUMBERS (advanced course), twice a week until January and weekly during the rest of the year.

2. NUMERICAL COMPUTATIONS, weekly from January to the end of the year.

DR. TABER.

Dr. Taber has lectured on the following subjects :

1. MODERN ALGEBRA (introductory course); symmetric functions of the roots of an equation, resultant of a system of equations, discriminants,

linear transformations, covariants and invariants. Twice a week until January.

2. APPLICATIONS OF THE THEORY OF MATRICES TO BI-PARTITE QUADRATIC FUNCTIONS; automorphic linear transformations, orthogonal substitutions, transformation between two quadrics, various cases of conditioned linear transformation between two bilinear forms (including the substance of Cayley's Memoir on the Automorphic Linear Transformation of the Bipartite Quadric Function, together with the lecturer's own investigations). Twice a week in the second half-year.

3. SYMBOLIC LOGIC; relation of the traditional system to symbolic logic, DeMorgan's additions, the Boolean calculus; Mitchell's system; the sixteen possible algebras with one universal and one particular copula; logic of relatives; Peirce's modification of Mitchell's method; categories of reasoning; philosophy of notation; different kinds of signs (icons, tokens, indices); characteristics of a complete system of notation. Twice a week in the second half-year.

DR. WHITE.

Dr. White has lectured on the following subjects :

1. MODERN SYNTHETIC GEOMETRY (Introductory Course); projective and perspective relations of one-dimensional point-systems and line-systems of the first and second orders, involution, duality in two-dimensional (flat) systems of points and of planes, the hyperboloid of one sheet.

2. HIGHER PLANE CURVES (Introductory Course); use of homogeneous coordinates, ordinary singularities of algebraic curves, projection and reciprocal figures, rational curves, Pluecker's relations, envelopes, tactinvariants, configuration and reality of inflexional points on the general cubic, conjugate points on the cubic, quadric transformation and general Cremona-transformations.

3. ALGEBRAIC SURFACES AND TWISTED CURVES (Introductory Course); singularities of surfaces and curves, classification of twisted curves, curves of the third and fourth orders and associated forms.

These three introductory courses occupied together two hours a week throughout the year.

4. THETA-FUNCTIONS OF THREE AND FOUR VARIABLES; relations between the simplest transcendental and algebraic functions upon a

Riemann's surface. Principal use has been made of standard works by C. Neumann and H. Weber, and of original papers by Riemann, Noether, H. Weber, and Schottky. Dr. G. F. Metzler and Mr. Hutchinson have been active collaborators; the latter has paid special attention to the theory of "exceptional" Riemann's surfaces, and has given lectures on two papers by Schottky in Crelle's Journal.

COURSES TO BE GIVEN NEXT YEAR, 1892-93.

During the academic year 1892-93, instruction will be given by lectures or otherwise in the following subjects, to which additions may be made later :

Advanced Courses :

1. The History of Algebra during the Renaissance.
2. Hyperspace and Noneuclidean Geometry.
3. Selected Topics of the Geometry of Surfaces and Twisted Curves.
4. Applications of Quaternions.

Introductory Courses :

5. The Calculus of Finite Differences.
6. Probabilities and the Theory of Errors.
7. Elements of Quaternions.
8. Theory of Functions according to Cauchy, Riemann and Weierstrass, with applications to functions defined by certain differential equations.
9. Modern Algebra.
10. General Theory of Higher Plane Curves.
11. General Theory of Surfaces and Twisted Curves.
12. Modern Synthetic Geometry.
13. Theory of Numbers.

The weekly conferences will be continued, and advanced students will be encouraged to give short courses of lectures on special topics in which they may be interested.

A course in Symbolic Logic will be given, if there be a demand for it.

II.

PHYSICS.

Instruction has been given in this department during the current year by

A. A. MICHELSON, PH. D., Professor of Physics.

A. G. WEBSTER, PH. D., Assistant Professor of Mathematical Physics.

PROFESSOR MICHELSON.

Professor Michelson has given a course of lectures on Optical Theories. These lectures constituted a review of the work which has been done in attempting to account for the phenomena of propagation, reflection and refraction in isotropic media, and double refraction in crystals. This includes a review of the works of Fresnel, Cauchy, Green, Rayleigh and others, concluding with the electro-magnetic theory of Maxwell and Hertz's investigations on electro-magnetic waves.

The researches involving "Applications of Interference Methods to Spectrum Analysis," have been completed, and the results are to be published under the auspices of the Smithsonian Institution, and are also to appear in the *Philosophical Magazine*, as Part II of the paper bearing this title which appeared in the *Philosophical Magazine* for April, 1891. These results appear sufficiently important to warrant the claim that by their means a new department of spectroscopy has been established, for which the author ventures to propose the title *Light-wave Analysis*.

In response to an invitation from the International Committee of Weights and Measures, Professor Michelson has consented to undertake the comparison of a light-wave with the prototype of the standard meter at Breteuil.

The instruments and appliances necessary for this work were constructed under the direct supervision of Mr. F. L. O. Wadsworth, Assistant in Physics, and it is chiefly due to his ingenuity and untiring energy that these have been so satisfactorily completed.

•

DR. WEBSTER.

Dr. Webster has lectured on the subject of Dynamics. The lectures until January, three times a week, took up the dynamics of systems of particles, the generalized equations of dynamics, and the methods of Lagrange and Hamilton. Since the beginning of the year the lectures have been devoted to the problem of the most general motion of a rigid body. While the first part of the course was entirely analytical, the second part, based upon the investigations of Poincot, has taken up largely synthetical methods, treating at length the composition of systems of vectors, and the properties of the linear complex having applications to kinematics and dynamics. The results of the investigations of Möbius, Chasles, Poincot, Plücker, and Ball were treated, and by the method of Plücker's line-coordinates the analytical treatment was introduced. The course will conclude with the analytical treatment of the rotation of a rigid body under the action of any forces.

Dr. Webster has continued his electrical researches described in last year's catalogue, much of his work having been devoted to the measurement of very small intervals of time.

Dr. T. P. Hall has continued his researches on surface-tension, described last year.

WORK FOR NEXT YEAR.

The department will be in charge of Assistant-Professor Webster.

Dr. Webster will continue his lectures on Dynamics, the subjects taken up in order being the Dynamics of Elastic and Fluid Bodies, the Dynamics of Oscillating Systems, leading up from systems with a finite number of degrees of freedom to those with an infinite number, concluding with the theories of Sound and Light. He will also give a course on the Mathematical Theory of Electricity and Magnetism, with practical applications. The introductory lectures in this course should be attended by such persons wishing to follow the course above described as are not familiar with the Theory of the Potential.

In connection with the Mathematical Department Dr. Webster will deliver a course of lectures on the Theory of Functions, where numerous applications to mathematical physics will occur.

FACILITIES.

The following rooms have been assigned for the use of the Physical Department.

On the lower floor or basement, are three rooms to be used for experiments requiring steadiness and freedom from vibration. The second room from the end is provided with solid piers, and with a partition dividing off a chamber for work requiring a uniform temperature. Experiments on wave-length measurements, and similar work, are to be conducted in this room. In the portion of the room outside the partition are two piers in front of the windows, designed for spectroscopic work. The third room contains the astronomical clock, balances, and cathetometer, and is now also used for electrical measurements. The fourth room is fitted up as a general workshop, and contains a lathe, machinist's bench, etc. This room communicates with a larger room, in which the engine, dynamo and other machinery are placed. The further end is used as a carpenter shop for pattern-making, etc. Beyond is the battery-room, containing twenty-six cells of storage-battery, and further on the general boiler-room.

On the second floor are three rooms, the first of which is the private laboratory and office of the director. The next room contains cases for apparatus not in use, as well as tables for work not requiring great steadiness. The third room is used as a lecture-room, and is adorned with Rowland's great spectrum map.

The following may be mentioned as among the more important pieces of apparatus: Armington & Sims engine, 10 H. P., engine-lathe, Edison dynamo, Becker balance, dividing-engines (line and circular), cathetometer and chronograph by the Société Genèvoise, astronomical clock, Ritchie air-pump, Ruhmkorff coil (30 cm. spark), revolving mirror, refractometers (for measuring wave-lengths). The department employs continuously an expert mechanic, who is engaged in the construction or alteration of such apparatus as may be needed.

In addition to the facilities for research above briefly mentioned, it may be mentioned that the physical library includes most of the modern standard works of reference and physical journals. Among the latter is a complete set of the *Annalen der Physik und Chemie*, *Comptes Rendus*, *Philosophical Transactions*, *Philosophical Magazine*, and *Nature*. The following physical periodicals are taken by the library: American

Journal of Science; Philosophical Magazine; Proceedings Royal Society; Electrician; Nature; Annalen der Physik und Chemie; Beiblatter do.; Exner's Repertorium; Zeitschrift für Instrumentenkunde; Zeitschrift für Physikalischen und Chemischen Unterricht; Berliner Sitzungsberichte; Wiener Sitzungsberichte; Annales de Chimie et de Physique; Journal de Physique; Comptes Rendus; Il Nuovo Cimento; Atti dei Lincei.

Several fellowships and scholarships will probably be at the disposal of the department for next year.

III.

CHEMISTRY.

WORK OF THE PAST YEAR.

Instruction has been given in this department by

J. U. NEF, Ph. D., Assistant Professor of Chemistry.

Owing to the fact that all the students in this department were advanced men, it was found unnecessary to give elementary lectures, such as lectures on general inorganic chemistry or on chemical analysis.

DR. NEF.

During the past year Dr. Nef has lectured as follows:

A course of Lectures on ORGANIC CHEMISTRY, three hours per week, all the year.

Special lectures were given on the fatty compounds, confined to the hydrocarbons, their halogen and nitro derivatives, the alcohols, ethers, amines, ketones, aldehydes, acids and the metallo-organic compounds. Besides discussing the characteristic reactions and relationships of these compounds, most attention was given to recent work on the subject.

Lectures on the AROMATIC SERIES. The object here again was to discuss the most recent advances made (four lectures alone being given on the constitution of Benzol), and so to incite the men to original methods of thinking and to become familiar with the chemistry of to-day as presented in the original papers.

LABORATORY WORK.

The laboratory instruction this year has been under the supervision of Dr. NEF.

In the organic preparation work, Emil Fischer's book is followed, and

the men are strongly advised to devote all the time possible to reading the original papers in connection with their work.

In quantitative and qualitative analysis the pamphlets of Volhard and Zimmermann are used.

The following laboratory courses are offered from year to year:

1°. *General Chemistry Experiments*,—Volhard, introductory to chemical analysis, 10 hours per week all the year.

2°. *Qualitative Analysis*, 15-20 hours per week all the year.

3°. *Quantitative Analysis*, 20 hours per week all the year.

4°. *Laboratory Practice* in determining molecular weights by vapor density and osmotic pressure methods.

5°. *Organic Preparations*, 20 hours per week all the year.

The more elementary laboratory courses are intended for those who elect chemistry as a subsidiary subject for their examination for the degree of Ph. D. The more advanced courses as well as the seminary are intended for those who are candidates for, or already have obtained the degree of Ph. D.

The following eight men have been at work this year as follows:—

Dr. Nef, with the assistance of *Dr. M. Ikuta*, has devoted his attention chiefly to research "on the bivalent carbon atom." The first paper on this subject has been sent off for publication.

Mr. Linebarger has undertaken some experiments on Osmose.

Mr. Bridge is just preparing a paper giving the results of his work on Nitrosophenol.

Mr. Clark has almost finished his dissertation on "The Addition products of Benzo-and Tolu-quinone."

Mr. Walker has been engaged in a study of the condensation products of Oxal and of Acet-acetic-ether with Phenylhydrazin. The work is progressing favorably.

Mr. Bernhard has been devoting himself to work on qualitative and quantitative analysis.

Mr. Smith has just finished his work on qualitative and quantitative analysis and has begun work on organic preparations.

CHEMICAL JOURNAL MEETINGS.

Meetings have been held regularly on Tuesdays from 4 to 6 p. m. throughout the year for the discussion of recent work in Chemistry. All connected with the chemical laboratory have been present regularly, each in turn taking part by presenting a piece of recent research work (either assigned or chosen). Generally two papers have been discussed at each meeting.

ROOMS AND FACILITIES.

A large Chemical Building, described elsewhere, has been completed and about half of the rooms already equipped for scientific work.

On the second floor of the chemical building is a large research room, and adjacent to it a store room, balance room, and combustion room, and lecture room. On the first floor is a steam room, air furnace room, and store room.

The large research room has ten working tables, each 12 feet long, and provided with gas and water and a trough in the middle—making it possible to carry on filtration, distillation in vacuum, and most chemical operations even on a large scale. There are sinks at each end of the tables, and for each table a separate large glass hood (2 x 5 ft.) with a height of 5 feet, making ten hoods in all.

On the third floor is the library, a large room equipped with all the periodicals, past and current, necessary for research work.

DR. NEF has a large room fitted up for his organic research work. It contains a desk equipped with gas and water and a lead trough just as the research room desks; also a large glass hood nine feet long, a sink, and a foot bellows and blast lamp.

The following special rooms are fitted up:

1. A room for microscopic and spectroscopic work, equipped with an analytical balance, a Fuess' microscope and polarization apparatus; a Krüss' spectral apparatus for qualitative and quantitative analysis, as well as for spark-spectra.

2. A dark room, equipped with a Fuess' goniometer, No. 2. with arrangements for monochromatic light and for measuring optical axes and refractive indices of crystals.

3. A small place in the cellar is fitted up for nursing crystals at low and constant temperature.

4. A private chemical laboratory for the quantitative chemical examination of minerals and rocks. This room is fitted with all the appliances for quantitative chemical work.

5. A room next to the one just mentioned is fitted up especially for microscopic and petrographic work. This room is also equipped with a black-board and demonstration table so that lectures on crystallography and petrography can be given where the material for illustration is close at hand.

6. A room for physical chemistry.

While instruction and direction in laboratory work is first in importance, the student will be expected to acquire a thorough knowledge of recent work in many lines of both inorganic and organic chemistry. It is only by this method that he will be able to concentrate his energies and do good independent work in a single direction, which it is especially desired to encourage here.

Just as a good training in organic preparation work is now considered an essential preliminary to successful research work in organic chemistry, so it is desirable that men should have preliminary training in working with the rarer inorganic elements before commencing research work in inorganic chemistry.

The chemical laboratory is now equipped with an almost complete library of periodicals, and has unusual facilities for advanced chemical work. The courses of instruction have been arranged largely to meet the wants of men who are candidates for the degree of doctor of philosophy, but are adapted also to others, both more and less advanced. They comprise (1) a regular graded series of lectures which are repeated from year to year, (2) lectures on special subjects which may cover a period of several years and which vary from year to year, and (3) a seminary where recent work in chemistry is discussed. Regular systematic courses of laboratory work have been arranged, which are given from year to year, very much like those accessible in any German laboratory.

After the student has completed all the necessary preliminary training, he can begin research work under the direction of some one of the instructors, and when sufficient material has been accrued for a thesis, present himself for the doctor's degree. The time necessary to accomplish this varies very much with different students, but it takes about two years

on the average. Since the majority of college graduates who have studied chemistry as a specialty have not had sufficient preliminary training to undertake research work at once, three years post-graduate work is generally necessary to obtain the degree Ph. D.

This laboratory also offers special inducements to more mature men who have already obtained the degree of Ph. D., and they are encouraged in prosecuting entirely independent work, and in special cases a private room may be equipped for their work.

Intending students of this class are urged to make known their wants to the department beforehand, so that the necessary material for their proposed work may be obtained in season. Such an advanced student, on finishing a good piece of independent work, can become a candidate for docentship, which gives him the right to deliver lectures and give instruction in the department for pay. Furthermore, in this as in other departments, a man who has taken the degree Ph D., and can present a good thesis of work done since, may be a candidate for the title of docent.

There is no other laboratory in the country which distinctly offers inducements to men, having obtained the Ph. D. degree, to pursue their work still further. It is felt here very strongly that this is of vital importance in order to develop men who by their research work will be a credit to science in this country.

CHEMICAL BUILDING.

The chemical building is constructed throughout of brick. The main body of the building has three stories, its southwestern wing has two stories, each 22 feet in the clear. Its facilities for heating and ventilation are substantially the same as those of the main building. The outer walls are two feet in thickness, and the partition walls from 12 to 16 inches. All partitions are of brick, so that the building is nearly fire-proof. There are two main laboratories, 24 x 58, and 22 feet high.

FIRST FLOOR.

- | | | | |
|----|---------------|----|-----------------------|
| 17 | Furnace Room. | 23 | Crystallization Room. |
| 10 | Boiler Room. | 16 | Steam Room. |
| 3 | Store Room. | 8 | Coal. |



Dimensions of Building, 134 feet 8 inches x 135 feet. Scale, 1 in.=about 34.10 ft.

SECOND FLOOR.

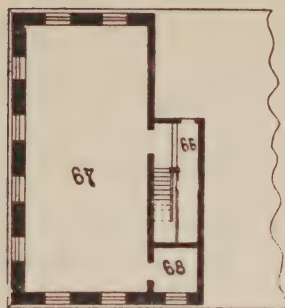
- | | |
|-----------------------------|------------------------|
| 26 Lecture Room. | 28 Balance Room. |
| 32—33 Store Rooms. | 34 Main Laboratory. |
| 35 Combustion Room. | 36—39 Crystallography. |
| 41 Physical Chemistry Room. | 45 Lecture Room. |



THIRD FLOOR.

- | | |
|--------------------------------------|----------------------|
| 57 Private Room. | 52 Dark Room. |
| 54 Private Laboratory of Dr. Nef. | 61 Chemical Library. |
| 51 Microscopy and Spectral Analysis. | |

FOURTH FLOOR.



The CHEMICAL LABORATORY contains

2 rooms 24 x 58 feet			22 feet high		
4	"	22 x 47	"	14 to 16	" "
3	"	26 x 32	"	"	" "
3	"	20 x 32	"	"	" "
4	"	22 x 24	"	"	" "
3	"	18 x 32	"	"	" "
3	"	16 x 18	"	"	" "
12	"	14 x 16	"	"	" "

and others varying from 12 x 16 and 10 x 22 to 6 x 6, making a total of 68 rooms.

IV.

BIOLOGY.

WORK DURING THE PAST YEAR.

Instruction has been given in this department as follows :

ANIMAL MORPHOLOGY.

- C. O. WHITMAN, PH. D., Professor of Animal Morphology.
J. P. McMURRICH, PH. D., Assistant Professor of Morphology.
W. M. WHEELER, Assistant in Animal Morphology.
S. WATASE, PH. D., Assistant and Lecturer in Zoology.
E. O. JORDAN, S. B., Fellow in Animal Morphology.
C. L. EDWARDS, PH. D., Fellow in Animal Morphology.
A. C. EYCLESYMER, B. S., Fellow in Animal Morphology.
C. L. BRISTOL, M. S., Fellow in Animal Morphology.
H. P. JOHNSON, A. M., Fellow in Animal Morphology.
F. R. LILLIE, A. B., Fellow in Animal Morphology.
A. D. MEAD, A. M., Fellow in Animal Morphology.

VERTEBRATE ANATOMY.

- F. P. MALL, M. D., Adjunct Professor of Anatomy.
W. S. MILLER, M. D., Fellow in Anatomy.

PHYSIOLOGY.

- W. P. LOMBARD, M. D., Assistant Professor of Physiology.
W. E. LOCKWOOD, M. D., Fellow in Physiology.

PALEONTOLOGY.

- G. BAUR, PH. D., Docent in Comparative Osteology and Paleontology.

A.—ANIMAL MORPHOLOGY.

PROFESSOR WHITMAN.

Professor Whitman has given a course of Lectures on EMBRYOLOGICAL PROBLEMS, directed to the more general needs of the work already begun in the laboratory.

A work on METAMERISM has been completed, which is to appear in a memorial publication by the pupils of Professor Leuckart, in honor of his seventieth birthday.

The following investigations have been carried on under the direction of Professor Whitman, in the Morphological Laboratory :

1. A contribution to the Embryology of the Insecta, by W. M. Wheeler. Ready for the press, and accepted as a thesis for the degree of Ph. D.
2. Researches in Cytology, by Dr. S. Watase.
3. The Embryology and Life-History of the Common Newt, by E. O. Jordan. Nearly completed, and accepted as a thesis for the degree of Ph. D.
4. The Development of Hippa, by Dr. C. L. Edwards.
5. The Development of the Amphibian Eyes, by A. C. Eycleshymer.
6. (a). A Contribution to the Morphology and Biology of the Stentors. (b). The Plastogamy of Actinosphaerium, by H. P. Johnson. Both works nearly completed.
7. The Morphology of Nephelis, by C. L. Bristol.
8. The Embryology of the Mollusca, by F. R. Lillie.
9. The Embryology of Annelids, by A. D. Mead.

THE BIOLOGICAL CLUB.

Monthly meetings have been held during the past season, at which the following lectures were given.

1. The Salisbury Expedition to the Galapagos Islands, by G. Baur.
2. The Third Eye of Vertebrates, by A. C. Eycleshymer.
3. Some Points in the History of Bacteriology, by E. O. Jordan.
4. Amphimixia in the Protozoa, by H. P. Johnson.

5. Nervous System of Mollusca, by F. R. Lillie.
6. Germ Cells, by S. Watase.
7. Mammalian Spermatogenesis, by S. Watase.
8. Metamerism in Arthropods, by W. M. Wheeler.

B.—ANATOMY.

DR. MALL.

Dr. Mall has given a course of lectures on the PORTAL SYSTEM, considering mainly the architecture of the organs from which the branches of the portal vein arise. It was attempted to show that forces independent of the heart aid or influence the circulation through some of the abdominal organs. Dr. Miller has given a lecture with demonstrations on the minute anatomy of the lungs.

DR. MILLER.

Dr. Miller's study of the lung is nearing completion and preparations are being made for an extensive paper to be published in the *Journal of Morphology*. A preliminary communication has been published recently in the *Anatomischer Anzeiger*.

Dr. Mall has completed a study on the histogenesis of the retina and optic nerve in *Amblystoma* and *Necturus*, the material, at the same time giving some valuable information regarding the morphology of nerves in general. The abdominal organs of three young human embryos have been modelled.

C.—PHYSIOLOGY.

DR. LOMBARD.

Dr. Lombard delivered a course of lectures upon the PHYSIOLOGY OF MUSCLES, NERVES AND THE SPINAL CORD. He also gave a practical course in physiology during a part of the year. In this course the men repeated the experiments of the preceding lecture, and made such other experiments, closely related to the subject in hand, as they desired. Dr. Lombard has continued his study of voluntary muscular contractions, and in connection with this subject, has given considerable attention to the study of tetanus.

DR. LOCKWOOD.

Dr. Lockwood, who had undertaken a careful study of the influences which determine the shape of the curve of voluntary muscular contrac-

tions and whose excellent work gave promise of important additions to our knowledge of this subject, was unfortunately taken ill quite early in the year, and compelled to discontinue the research.

MR. DRESSLAR.

Mr. Dresslar has been studying the influences which affect the rate at which it is possible to repeat a voluntary muscular act. He greatly improved the apparatus which Dr. Lombard devised for recording the curve of the rate of recurrence of such movements, and he has obtained many results which will help to a better understanding of the influences which determine the activity of certain central nervous processes.

PROFESSOR BRYAN.

Professor Bryan began a research upon the mutual influence exerted by simultaneous muscular acts, and the meaning of associated movements, etc., with reference to mechanical skill. The pressure of other work, however, compelled him to postpone the further study of these most interesting questions.

DR. SCRIPTURE.

Dr. Scripture has made use of the facilities afforded by the laboratory to pursue his experiments on the "Threshold" of the Intensity of Sound.

During the year many other men have made use of tools, apparatus and laboratory for certain portions of their research work.

D.—OSTEOLOGY AND PALEONTOLOGY.

The expedition to the Galapagos Islands, for which preparations had been made during the last year, was made possible through the contributions of Mr. Stephen Salisbury, Prof. H. F. Osborn, and the Elizabeth Thompson Science Fund. Dr. Baur, accompanied by Mr. C. F. Adams, of Champaign, Ill., started from New York on May 1st and returned after a very successful trip Oct. 2d. The intention to visit all the Islands could not be fully carried out; but all with the exception of Narborough, Wenman and Culypper were examined and very extensive corrections made. By this expedition it has been definitely shown, that the distribution of the fauna of the Galapagos is harmonious, and that the origin of the groups therefore can only be explained by the subsident theory, but not by the theory of elevation of Darwin, Wallace and others.

The collections have been distributed among different scientists, and some of the preliminary reports have already appeared.

1. Wm. H. Dall, on Some Types New to the Fauna of the Galapagos Islands. *The Nautilus*, Vol. V, No. 9.

2. J. A. Allen, on A Small Collection of Mammals from the Galapagos Islands, collected by Dr. G. Baur. *Bull. Amer. Mus. Nat. Hist.*, Vol. IV, No. 1, 1892.

The others reports by Mr. S. Garman, Dr. Geo. Marx, Mr. Robert Ridgway, Dr. G. Baur and others will appear soon. Dr. Baur has published an account of the expedition in the "Beilage" of the *Allgemeine Zeitung*, Munich, Feb. 1-4, 1892, which has also been printed separately.

During the year Dr. Baur has lectured on Osteology of Mammals living and extinct.

V.

PSYCHOLOGY.

A.—NEUROLOGY.

DR. DONALDSON.

Dr. Donaldson has lectured throughout the year on the anatomy of the nervous system including therein the current views on the localization of functions in the cerebral cortex. In connection with the lectures a practice course on the histology of the nervous system has also been given. The description of the brain of Laura Bridgman has been completed and the account published in the *American Journal of Psychology*, Vol. IV, No. 2, December, 1891. In the same place an investigation on the size of the cranial nerves in man, made conjointly with Mr. Bolton, has been also published. The work on the action of hardening reagents on nervous tissue has been continued but is still unpublished.

MR. BOLTON has almost completed a paper upon the spinal cord of a horse that had been afflicted with springhalt. A lesion has been found distributed throughout both the dorsal and ventral columns of the cord, and in the motor fibres of the spinal roots between the levels of the third lumbar and second sacral nerves.

He has also published a paper in the December number of the *American Journal of Psychology*, 1891, on the size of the several cranial nerves in man. This work was undertaken as subsidiary to the work Dr. Donaldson was doing upon the brain of Laura Bridgman.

B.—EXPERIMENTAL PSYCHOLOGY.

DR. SANFORD.

Dr. Sanford's lectures have outlined the very large chapters of Comparative Psychology and Hypnotism. In treating the first, the micro-organisms, ants, the cat and dog, and the child to three years old were used as types.

The subject of Hypnotism was introduced by a consideration of normal sleep and dreams, and several lectures were devoted to the related subject of double consciousness. Dr. Sanford, with the assistance of Mr. Bolton, directed the Laboratory Practice Course, also supervised research work and conducted a weekly Conference on the subjects taken up in the practice course, taking up the senses, time relations of mental processes, the psycho-physic law (studying especially the *Psychophysik* of G. E. Müller) and association. Dr. Sanford has devoted considerable time to a careful revision of his Laboratory Course in Physiological Psychology, and continued the publication of it in the *American Journal of Psychology*, and in connection with this and for use in the practice course he has designed several promising pieces of apparatus.

DR. SCRIPTURE.

Dr. Scripture has been investigating two problems: 1. The determination of the function $d=f(n, i, r)$, where d is the least perceptible difference in pitch, n the pitch-frequency, i the intensity and r the rate at which the pitch is varied. This takes into consideration two hitherto neglected variables, i and r ; qualitative results already show that the d is intimately dependent on r . 2. The determination of $R=f(n, i, r')$ where R is the reaction-time, n and i the same as in the previous case and r' the rate of variation of the intensity. Several new facts have appeared: a. The question of the rate of variation has led to the treatment of a new psychological method, the method of a regular variation (see *American Journal of Psychology*, 1892, IV, July); b. A new psychological quantity has been found, the least perceptible acceleration. Let x denote the varied sensation and t the time, then the least perceptible variation is $d=f\left(\frac{dx}{dt}\right)$; the least perceptible acceleration will be $d=f\left(\frac{d^2x}{dt^2}\right)$. c. It has been proven that $T=f(i, r)$ where T denotes the lowest audible tone. d. Likewise $I=f(n, r')$ where I is the weakest perceptible sound.

A large part of the year has been devoted to the preparation of a work entitled "Problems in Hearing, A Handbook of Psychological Measurements," to be published soon. During the latter part of the year Dr. Scripture has been assistant editor of the *American Journal of Psychology*.

MR. T. L. BOLTON.

Mr. T. L. Bolton has made a statistical study of memory in children of the Worcester schools, the results of which are to appear in the *American*

Journal of Psychology for April, 1892. Further study by the same method is now being carried on to determine the curve of practice in remembering figures, the extent of unconscious memory, and differences in memory power in children under different circumstances. Mr. Bolton also has ready for publication a paper on the fineness of the ear for the comparison of groups of very rapid clicks and the behavior of the memory after-image, embodying the results of experiments made during the academic year 1890-91.

MR. W. L. BRYAN.

Mr. W. L. Bryan has been chiefly engaged with investigations upon the motor ability of man. Apparatus for this purpose has been devised as follows: 1. Apparatus (2 pieces) for measuring the precision of voluntary movements. 2. A mechanical counter for measuring the rate of movement. 3. A double dynamometer for the study of strength and endurance in relation to bilateralism. 4. A reaction-time apparatus designed to afford under theoretically perfect conditions a series of successive stimuli each brought into play by the subject's response to the preceding stimulus. Investigation is still in progress and preliminary results have been reached with all except the last.

MR. A. FRASER.

Mr. A. Fraser has published in the *American Journal of Psychology* the results of investigations in the Psychology of Philosophy in two articles, namely, a paper on the Philosophy of Hobbes, Locke, Berkeley and Hume, showing the influence of visualization in determining the character of their philosophical systems; and a paper on the Psychological Foundation of Natural Realism in which an attempt was made to show that what the Scottish philosophers were striving to express in the doctrine of "immediate perception" was tactual perception. Mr. Fraser has also another study almost ready for publication on the Logic of Hegel.

MR. J. S. BERGSTRÖM.

Mr. J. S. Bergström has given the most of the year to the study of the Diurnal Variations of Mental Vigor. This has been tested by different methods and upon a number of different individuals. The results will be published later. Mr. Bergström has also studied the Influence of Oral Expression on the Rapidity of Recollection, the Duration of the Memory After-Image, and Some Simple Methods for Time-measurements of Mental Processes.

MR. F. B. DRESSLAR.

Mr. F. B. Dresslar entered the University a month late. Since his entrance he has studied, from historical data, the subject of Ecstasy, and, by experiment, the subjects of Fatigue, the Feeling of being "shut in" when any object is brought near the face, and the Perception of Depth by Vision in unusual positions of the head. The experimental work is in satisfactory progress, with prospect of completion before the end of the year.

MR. J. P. FRUIT.

Mr. J. P. Fruit, during the three months of his stay, devoted himself chiefly to a study of the Psychology of Humor.

DR. W. O. KROHN.

Dr. W. O. Krohn has been engaged with Mr. Bolton in a very promising experimental study of the Phenomena of Attention in Dermal Sensations. Important results are in sight with reference to simultaneous touches on sensitive and insensitive parts of the skin, upon parts usually covered or not covered by the clothing, upon projection and localization of sensation, and upon bilateralism. Dr. Krohn has also in preparation a comprehensive study of Colored Hearing and related phenomena.

MR. E. N. BROWN.

Mr. E. N. Brown, since his entrance in January, has given special attention to the Pedagogy of Animals as a special case of applied Psychology and Pedagogy.

NEXT YEAR.

The Courses in Psychology for the next academic year will be as follows:

A COURSE OF LABORATORY PRACTICE AND DEMONSTRATION.

1. This will consist of about 300 experiments covering the chief problems of touch, taste, smell, hearing, vision, psycho-physic law, reaction times, association, memory, rhythm, etc. This course will follow the normal course now being worked out by Dr. Sanford in the *American Journal of Psychology*, and is intended to give practical familiarity with psycho-physic apparatus, methods and phenomena, and will occupy three afternoons a week.

2. ASSISTANT PROFESSOR SANFORD will lecture two times a week through the year on Physiological Psychology. This course will supplement and be concurrent with course 1. It will treat of the history, methods, and results of modern experimental psychology, and will involve digests of recent literature.

3. DR. SANFORD will conduct a course of two sessions per week through the year, partly by lecture and partly by seminary upon instinct, dreams, hypnotism and other topics, with demonstrations. The psychological parts of anthropology (myth, rites and custom) may be included in this course.

4. PRESIDENT HALL will lecture through the year upon the history of philosophy, beginning with Greek philosophy. In addition to the ground usually treated in the history of philosophy this course will include surveys of the history of psychology, medical systems and education. The course will be given with constant reference to the philosophical, ethical, psychological problems of to-day.

5. Weekly Conferences, conducted jointly or alternately by Drs. Hall and Sanford, will be devoted to lecturettes, journal club work, quizzes and seminary study of selected themes in the field of psychology and philosophy.

6. Investigation. Each advanced student is expected to select, in conference with Drs. Hall or Sanford, some promising topic of research, either experimental or literary, and to have something to show for his work before the end of the year.

Good literary digests in 5, or valuable studies in 6 may be published in the *American Journal of Psychology* edited by the department.

Further announcements for next year may follow.

VI.

EDUCATION.

DR. BURNHAM.

Dr. Burnham has lectured during the year on School Hygiene and Physical Education. The Seminary Meetings, once a week during the year, have been devoted to special subjects. Brief reports on current literature have been presented. Dr. Burnham has studied the general subject of School Hygiene comparatively and from the point of view of the hygiene of the Nervous System, and has published in the *Pedagogical Seminary* a comprehensive paper on the outlines of School Hygiene. Excursions to Educational Institutions—The Perkins Institution for the Blind, the McLean Asylum, State Normal School, Worcester School Houses, etc., have been made at intervals during the year.

MR. F. B. DRESSLAR.

Mr. F. B. Dresslar has made a historical study of Old School Houses, an account of which will be printed in the *Pedagogical Seminary*.

DR. T. P. HALL.

Dr. T. P. Hall has studied the subject of Medical Inspection of Schools in different countries.

MR. J. S. LEMON.

Mr. J. S. Lemon has devoted special attention to the subject of Religious Instruction, and the relations between Church, State, and the School.

DR. G. F. METZLER.

Dr. G. F. Metzler has studied the History of Methods of Instruction in Mathematics, with special reference to the Teaching of Arithmetic.

MR. W. H. METZLER.

Mr. W. H. Metzler has made a comparative study of the Acquirements of the Average Student at the Age of Admission to College in different countries.

MR. A. S. OLLIN.

Mr. A. S. Ollin was present at the University only till January. During that time he studied historically the subject of Emulation in Education.

Papers have been presented also by other members of the Seminary, on the Teaching of Modern Languages, on Universities, Comenius, Apperception, the training of Attention and Will, and other topics concerning present educational movements and the like. The results of several of the above studies will soon be published in the *Pedagogical Seminary*.

NEXT YEAR.

DR. BURNHAM.

Dr. Burnham will conduct the following courses :

1. Devoted to Reading, Mathematics and Geography.

(a) READING AND LITERATURE. Historical Development, Myths, Legends, Epics, Sacred Books. The *Kultur-historische Stufen*. The reading-book as the centre of instruction. Literature adapted to different ages. The reading-book as a means of conveying instruction in morals and religion. Different methods of teaching reading. Text-books and apparatus. The psychology of reading. The hygiene of reading. The mother-tongue. Literature. The teaching of composition and rhetoric. The teaching of English literature.

(b) MATHEMATICS. Conceptions of number among animals, savages and children. Philosophical conceptions of number among the ancients and in modern times. Individual differences, number-forms, etc. Methods of teaching number. *Ausschauungsmittel*. Different kinds of apparatus. Amount and character of mathematical work in schools of different countries. Modern methods.

(c) GEOGRAPHY. Conceptions of the ancients. Genesis of geographical science. Ritter, Humboldt, Herder, Peschel, et al. Geography in relation to history. Geography as basis of the natural sciences. Development of methods of instruction. Maps, charts, and devices. *Heimatskunde*

2. A course upon select chapters from the history, psychology, and chief present problems of education, embracing educational ideals among the ancient peoples—Chinese, Babylonians, Persians; also adolescence, hygiene, memory, pedagogy in universities, Rousseau, Pestalozzi. Once a week through the year, by lectures and conferences, and with digests of recent literature.

3. The work in the Seminary will be, for the most part, adapted to individual students. It is hoped that each student will select, after conference with Drs. Hall and Burnham, a topic for special investigation, for which the resources of the University will be available. These and the digests in 2 may be published in the *Pedagogical Seminary*, a journal published by this department.

LIBRARY.

The University Library now contains 15,500 bound volumes and 1,500 pamphlets, and the reading room receives 239 journals. With the exception of 3,200 congressional publications and other contributed volumes the library and the journals represent chiefly the five departments.

The books are grouped as follows :

A	WORKS OF GENERAL REFERENCE.	I	PSYCHOLOGY.
B	JOURNALS.	J	PHILOSOPHY.
C	MATHEMATICS.	K	ETHICS.
D	PHYSICS.	L	CRIMINOLOGY.
E	CHEMISTRY.	M	ANTHROPOLOGY.
F	ZOOLOGY.	N	EDUCATION.
G	PHYSIOLOGY.	O	BOTANY.
H	PATHOLOGY.		

Books not included under any of these subjects are grouped as Miscellaneous, and marked according to their room, case, tier and shelf. They comprise in addition to Congressional publications, bound files of magazines, several score of rare old books, a collection of Art publications, Travels, Complete Works, Sets of Reports, Histories, Biographies, etc.

The Library of the University at present consists of six rooms. I. The large General Room, containing A, B, C, D, F, G, H, I, J, K, L, M, and O. II. The Journal Room. This contains chiefly current numbers of journals and books of reference. The Journals are arranged on broad shelves on

each side of the room for ready inspection. III. The Educational Room. This contains all the Educational works except State and City Reports and College publications, which have a place and a catalogue by themselves. IV. Chemical Library room, containing both the books and periodicals in that department and labelled C. V. A small store room for books not yet placed on the shelves or catalogued. VI. A small room for duplicates, unbound copies of journals, etc. Besides the subject classification, books are arranged in cases, tiers, shelves, etc.

All the privileges of the Library are open to all appointees of the University alike.

The Library is open from 8 A. M. to 6 P. M. and each member of the University has direct access to every book and journal.

Outside the University are found :

The Library of the Antiquarian Society, organized in 1812, containing 90,000 volumes, and which is accessible to all members of the University.

The Worcester Public Library, containing about 360 periodicals and 86,000 volumes, has supplemented the scientific publications purchased by the University and all the privileges are accessible without charge.

A Medical Library of 8,000 volumes is also accessible.

By the courtesy of the Librarian of Harvard University and of the Surgeon General at Washington books from both these institutions are sent to the University for a limited time, and by the courtesy of S. S. Green of the Worcester Public Library, all the resources of that institution and its facilities for borrowing from distant libraries are available to all members of the University.

By an arrangement with several large book dealers the latest publications from Europe as well as from this country are exposed for inspection or sale upon the Library tables.

LIBRARY RULES.

1. No loud talk is allowed in any part of the Library or Reading Room.

2. Any book may be called in at three days' notice at the discretion of the Secretary of the Library Committee.

3. Any member of the staff may reserve from circulation such books as he deems necessary in connection with the courses given in his department ; and these shall be placed in a case, by themselves, marked "Reserved," in the Reading Room.

4. Current numbers of Periodicals shall not be taken out until they have been in the Library two weeks.

5. Reserved books and current numbers of periodicals, exempt from circulation, may be taken out after 5.30 P. M., but must be returned before 9 o'clock the next morning, excepting that such books, taken out Saturday P. M. may be kept until 9 o'clock the next Monday A. M.

6. All Dictionaries, Cyclopædias, and books of general reference, are permanently reserved.

7. Books of great value may be taken out only by special permission.

HISTORY AND BUILDINGS.

Clark University was founded by the munificence of a native of Worcester County, whose plans, conceived more than twenty years ago, have gradually grown with his fortune.

He has done so with the strong and express desire that the highest possible academic standards be here forever maintained ; that special opportunities and inducements be offered to research ; that to this end the instructors be not overburdened with teaching or examinations ; that all available experience, both of older countries and our own, be freely utilized, and that new measures, even innovations, if really helpful to the highest needs of modern science and culture be no less freely adopted ; in fine, that the opportunities of a new foundation in this land and age be diligently explored and improved.

He has chosen Worcester as the seat of the new foundation after mature deliberation—first :

Because its location is central among the best colleges of the East, and by supplementing rather than duplicating their work, he hopes to advance all their interests and to secure their good will and active support, that, together, further steps may be taken in the development of superior education in New England ; and secondly :

Because he believes the culture of this city will ensure that enlightened public opinion indispensable in maintaining these

educational standards at their highest ; and that its wealth will ensure the perpetual increase of revenue required by the rapid progress of science.

During the five years preceding the date of the charter, 1887, Mr. Clark had gradually acquired a tract of land comprising over eight acres, located on Main street, about a mile from the heart of the city, with additional tracts near by. This land has considerable elevation above that part of the city, is a watershed sloping to the southeast, ensuring sanitary excellence and a wide and picturesque view. A park reservation of about 25 acres, directly opposite, has been set apart by the city, and named University Park.

Plans for a main building were submitted to the Board by Mr. Clark, which were approved, and its erection was at once begun. The corner-stone was laid with impressive ceremonies, Oct. 22, 1887. The building is plain, substantial and well appointed, 204x114 feet, four stories high and five in the centre, with superior facilities for heating, lighting and ventilation, and has been constructed of brick and granite, and finished throughout in oak.

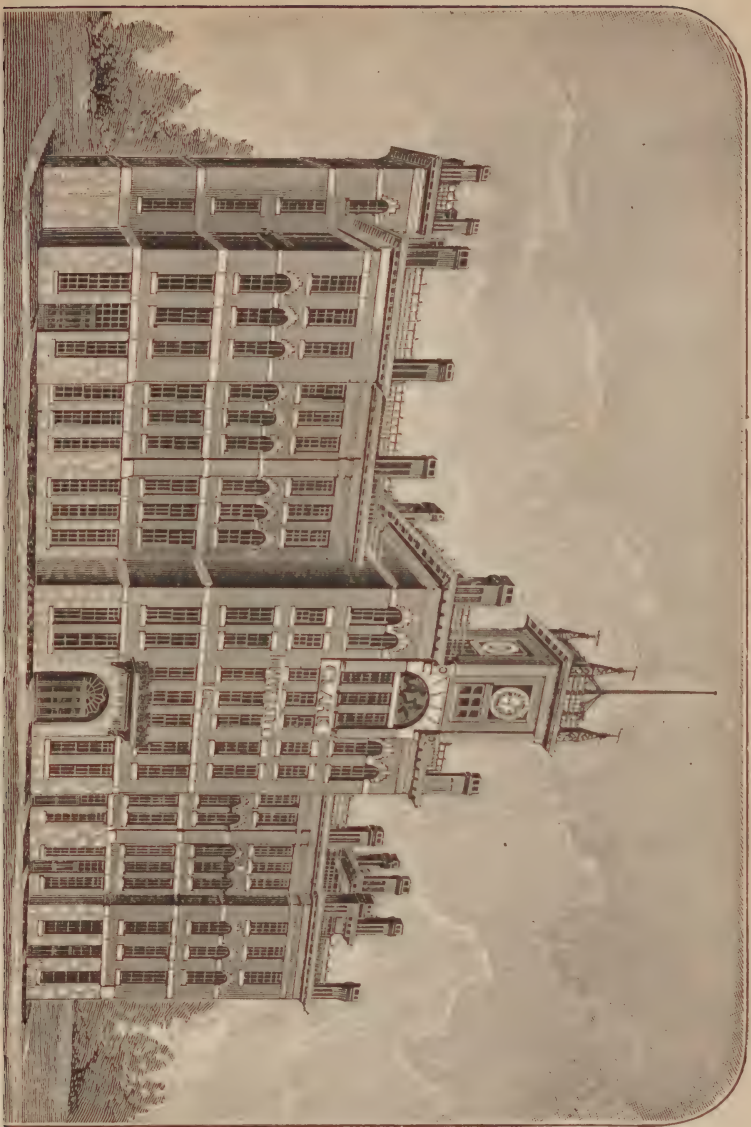
The following year a Chemical Building was planned and erected. It is constructed throughout of brick and contains in all 68 rooms. The main body of the building has three stories, its southwestern wing has two stories, each 22 feet in the clear. Its facilities for heating and ventilation are substantially the same as those of the main building. The outer walls are 2 feet in thickness, and the partition walls from 12 to 16 inches. All partitions are of brick, so that the building is nearly fireproof. There are two main laboratories, 24x58, and 22 feet high.

The foundations of another department building are laid.

The Buildings are situated on a lawn of about 8 acres with a frontage of 800 feet on Main street. The location is high and the building is placed on the most elevated point of ground and commands an extensive view over the city and the surrounding hills. The location of the buildings is shown in the following plan.



The Rules and Regulations will be published later.



PUBLICATIONS CONNECTED WITH THE UNIVERSITY.

I.—THE JOURNAL OF MORPHOLOGY.

This Journal was commenced in September, 1887, and is edited by Professor C. O. Whitman, with the co-operation of Edward Phelps Allis, Jr., of Milwaukee. From three to six numbers a year are issued, in crown octavo, of 150 to 200 pages each, with from five to ten lithographic plates. Vol. I (two numbers), \$6.00; Vols. II, III, IV, and V (three numbers each) \$9.00 per vol.; single numbers, \$3 50. Ginn & Co., Publishers, Boston, Mass.

II.—THE AMERICAN JOURNAL OF PSYCHOLOGY.

This Journal was commenced in November, 1887, and is edited by Dr. G. Stanley Hall. Each volume contains four numbers of about 150 pages each. Besides original articles, about half its space is devoted to careful digests of the important literature in its field. Price \$5.00 per volume; single numbers \$1.50. J. H. Orpha, Publisher, Worcester, Mass.

III.—The First Official Announcement was issued May 23d, 1889.

IV.—The Addresses and Exercises at the opening of the University on October 2d, 1889.

V.—Register and Second Official Announcement, May, 1890.

VI.—First Annual Report of the President to the Board of Trustees, October 4, 1890. This contains the first statement

of the plan, aims and methods of the University, and reports upon the original investigation of each department from each member who has made such. *

VII.—Register and Third Official Announcement, April, 1891.

VIII.—Second Annual Report of the President to the Board of Trustees, September 29, 1891.

VII.—THE PEDAGOGICAL SEMINARY.

This Journal was begun in January, 1891, and is edited by the President of the University. It is an International Record of Educational Literature, Institutions and Progress, and is devoted solely to the highest interest of Education in all grades, with digests of important literature of all countries. Each volume will probably contain 400 or 500 pages. It is the organ of the Educational Department of the University. Price, \$4.00 per volume. Single numbers, \$1.50. J. H. Orpha, Publisher, Worcester, Mass.

INDEX.

APPOINTMENTS.

	Page.
Staff,	1
Docents,	2
Assistants,	3
Honorary Fellows,	4
Fellows,	4
Scholars,	7

ADMINISTRATION.

Trustees,	9
President and Faculty,	10

GENERAL STATEMENTS,

Admission,	13
Classes of Appointees,	15
1—Docents,	16
2—Candidates for Doctorate,	18
3—Special Students,	20
4—Preliminary Candidates,	21

FELLOWSHIPS AND SCHOLARSHIPS,

Clark Fellowships, etc.,	22
Purpose of Fellowships,	23
Methods,	25
Notices,	26

DEPARTMENTS.

I—Mathematics,	30
II—Physics,	38
III—Chemistry,	42
IV—Biology,	50
V—Psychology,	55
VI—Educational,	60
Next Year,	61

LIBRARY, 63

HISTORY AND BUILDINGS, 66

PUBLICATIONS, 69



Clark University
in the City of Worcester,
Massachusetts.

Register and
Fifth Official
Announcement.

1893.

TRUSTEES OF THE UNIVERSITY.

President,	-	-	-	-	JONAS G. CLARK.
Vice-Presidents,	-	-	-	-	{ GEORGE F. HOAR. WILLIAM W. RICE.
Treasurer,	-	-	-	-	THOMAS H. GAGE.
Secretary,	-	-	-	-	FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark.	
Stephen Salisbury.	John D. Washburn.
Frank P. Goulding.	George F. Hoar.
George Swan.	William W. Rice.
Edward Cowles.	Thomas H. Gage.

COMMITTEES.

FINANCE.

Jonas G. Clark.
Stephen Salisbury.
John D. Washburn.
Thomas H. Gage.

BUILDINGS.

Jonas G. Clark.
Stephen Salisbury.

BY-LAWS.

Jonas G. Clark.
William W. Rice.
John D. Washburn.
Stephen Salisbury.
George Swan.

James P. Hamilton, - - - Cashier.

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Fifth Official Announcement.

WORCESTER, MASS.:

PUBLISHED FOR THE UNIVERSITY.

May, 1893.

CALENDAR: 1893-94.

1893.

JUNE 22. Thursday. Present academic year ends.

SEPT. 27. Wednesday. Fifth academic year begins.

DEC. 23. }
1894. } Christmas Recess.
JAN. 2. }

Date of the Spring Recess and close of next academic year
to be determined later.

MEMBERS.

G. STANLEY HALL, PH. D., LL. D., President of the University. 94 Woodland St.

A. B., Williams College, 1867, and A. M., 1870; Ph. D., Harvard University, 1878; Lecturer in Harvard and Williams Colleges, 1880-1881; Professor of Psychology, Johns Hopkins University, 1881-1888; LL. D., University of Michigan, 1888; and Williams College, 1889.

WILLIAM E. STORY, PH. D., Professor of Mathematics. 17 Hammond St.

A. B., Harvard University, 1871; Ph. D., Leipzig, 1875; Parker Fellow (Harvard), 1874-75; Tutor of Mathematics, Harvard University, 1875-76; Associate, Assistant Professor, and Associate Professor of Mathematics, Johns Hopkins University, 1876-89; Member of the London Mathematical Society; Resident Fellow of the American Academy of Arts and Sciences.

CLIFTON F. HODGE, PH. D., Assistant Professor of Physiology and Neurology. 11 Tirrell St.

A. B., Ripon College, 1882; Fellow in Biology, Johns Hopkins University, 1888-89; Ph. D., Johns Hopkins University, 1889; Fellow in Psychology and Assistant in Neurology, Clark University, 1889-91; Instructor in Biology, University of Wisconsin, 1891-92.

EDMUND C. SANFORD, PH. D., Assistant Professor of Psychology. 21 Oread Place.

A. B., University of California, 1883; Fellow of Johns Hopkins University, 1887; Ph. D., Johns Hopkins University, 1888; Instructor in Psychology, Johns Hopkins University, 1888.

HENRY TABER, PH. D., Assistant Professor of Mathematics. 9 Oread Place.

A. B., Yale (Sheffield Scientific School), 1882; Ph. D., Johns Hopkins University, 1888; and Assistant in Mathematics, Johns Hopkins University, 1888-89.

ARTHUR G. WEBSTER, PH. D., Assistant Professor of Mathematical Physics. 936 Main St.

A. B., Harvard, 1885, with honors in Mathematics and Physics; Instructor in Mathematics, Harvard, 1885-86; Parker Fellow, 1886-89; Universities of Berlin, Paris, Stockholm, 1886-90; Ph. D., Berlin, 1890.

WILLIAM H. BURNHAM, PH. D., Instructor in Pedagogy.
100 Chatham St.

A. B., with honors in Philosophy, Harvard University, 1882; Instructor in Wittenberg College, 1882-83; Instructor in the State Normal School, Potsdam, N. Y., 1883-85; Fellow Johns Hopkins University, 1885-86; Ph. D., 1888, and Instructor in Psychology, 1888-89.

SAMUEL P. MULLIKEN, S. B., PH. D., Instructor in Chemistry. 100 Chatham St.

S. B., Mass. Institute of Technology, 1887; Assistant in Chemistry, University of Cincinnati, 1887-88; Ph. D., University of Leipzig, 1890; Fellow in Chemistry, Clark University, 1890-91; Associate in Chemistry, Bryn-Mawr College, Bryn-Mawr, Pa., 1891-92.

A. F. CHAMBERLAIN, PH. D., Lecturer in Anthropology.
20 Grand St.

B. A., University of Toronto, Canada, 1886; M. A., University of Toronto, 1889; Fellow (tutorial and post-graduate work) in Modern Languages in University College, Toronto, 1887-90; Examiner in German in University College, and the University of Toronto, 1888-92; Examiner in Modern Languages in the University of Trinity College, Toronto, 1890-91; Examiner in French and German, Department of Education, Ontario, 1888-89; Anthropological Researches in British Columbia under the auspices of the British Association for the Advancement of Science, summer of 1891; Fellow of the American Association for the Advancement of Science.

BENJAMIN IVES GILMAN, A. M., Instructor in Psychology.
12 Oread St.

A. B., Williams College, 1872; A. M., 1880; Fellow of the Johns Hopkins University, 1881-83; Lecturer at Princeton, Harvard and Columbia Colleges, 1890-91.

ARTHUR A. NOYES, PH. D., Lecturer in Physical Chemistry.
1892-93.

S. B., Mass. Institute of Technology, 1886; and M. A., 1887; Instructor in Analytical Chemistry, Mass. Institute of Technology, 1887-88; Student University of Leipzig, 1888-90; Ph. D., Leipzig, 1890; Instructor in Chemistry, Mass. Institute of Technology, 1890-93.

JOSEPH DE PEROTT, Docent in Mathematics.
13 Woodland St.

Universities of Paris and Berlin, 1877-80.

THADDEUS L. BOLTON, A. B., Demonstrator and Fellow in Psychology. 53 Eastern Ave.

A. B., University of Michigan, 1889; Principal Public Schools, Vulcan, Mich., 1889-90.

THOMAS H. CLARK, B. S., PH. D., Worcester, Mass., Assistant in Chemistry. 22 Lancaster St.

B. S., Polytechnic Institute, Worcester, Mass., 1890; Johns Hopkins University, 1883; Assistant in Chemistry, Wesleyan University, Middletown, Conn., 1886-89; Ph. D., Clark University, 1892.

B. C. HINDE, A. M., Assistant and Fellow in Physics.

1018 Main St.

A. B., Central College (Mo.), 1881, and A. M., 1882; Instructor in Physical Sciences, Howard College, 1882-88; Johns Hopkins University 1888-90; Professor of Physics and Chemistry, Mo. State Normal, 1890-91; Professor of Physics, Trinity College, N. C., 1891-92.

H. AUSTIN AIKINS, PH. D., Toronto, Ont., Fellow in Psychology. 1018 Main St.

B. A., University of Toronto, 1887; Instructor in University of Southern California, 1888; Yale University, 1888-91; and Lecturer on History of Philosophy in Yale, 1890-91; Ph. D., Yale, 1891; Professor of Logic and Philosophy in Trinity College, N. C., 1891-92.

THOMAS P. BAILEY, JR., PH. D., Fellow in Psychology. 625 Main St.

B. A., South Carolina College, 1887; Tutor in English and History, University of South Carolina, 1888-89; M. A., 1889 and Ph. D., 1891, University of South Carolina; Adjunct Professor of Biology, South Carolina College, 1891-92.

J. A. BERGSTRÖM, A. B., Middletown, Conn., Fellow in Psychology. 5 Gates St.

A. B., Wesleyan University, 1890.

WM. L. BRYAN, A. M., Bloomington, Ind. 23 Benefit St.

A. B., Indiana University, 1884, and A. M., 1886; Berlin University, 1886-87; Instructor, Associate and Professor of Philosophy, Indiana University, 1885 to present. Absent on leave.

F. B. DRESSLAR, A. M., Banta, Ind., Scholar in Psychology. 23 Benefit St.

A. B., University of Indiana, 1889; A. M., 1892; Instructor in Vincennes University, 1888; Principal of High School, Princeton, Indiana, 1889-90; and Superintendent of City Schools, 1890-91; Assistant in Philosophy, Indiana University, fall term, 1892.

JOHN H. GRAY, JR., B. S., Berkeley, Cal., Fellow in Chemistry. 70 Florence St

B. S., University of California; Assistant to State Analyst (of California), 1887-90; Assistant in Chemistry, University of California, 1889-90; Instructor in Chemistry, University of California, 1890-92.

T. PROCTOR HALL, PH. D., Fellow in Physics. 12 Woodbine St.

B. A., University of Toronto, 1882; Fellow and Instructor in the Chemical Laboratory, University of Toronto, 1883-84; F. C. S. (Eng.), 1885; M. A., Ph. D., Illinois Wesleyan University, 1888; Science Master, Woodstock College, Woodstock, Ontario, 1885-90.

THOMAS F. HOLGATE, M. A., Foxboro, Ont., Canada, Fellow in Mathematics. 17 Freeland St.

B. A., Victoria College, Toronto, 1884; M. A., 1889; Mathematical Master, Albert College, Belleville, Ont., 1884-90.

FREDERICK TRACY, A. B., Claremont, Ont., Fellow in Psychology. 15 Florence St.

Pickering College, 1883; Commercial Master in Pickering College, 1885; A. B., University of Toronto, 1889; Fellow in Philosophy, University of Toronto (lecturing and post-graduate work), 1889-92; Examiner in Philosophy, University of Toronto, 1890-92.

CHARLES WALKER, B. C. E., M. A., Knoxville, Tenn., Fellow in Chemistry. 4 Crown St.

B. C. E. and B. App. Ch., University of Tenn., 1885; and M. A., 1886; Assistant Professor of Chemistry and Physics, University of Tenn., 1886-88; Assistant in Chemistry, U. S. Naval Academy, Annapolis, Md., 1889-90.

OSCAR CHRISMAN, A. B., Gonzales, Texas., Fellow in Pedagogy. 19 Shirley St.

Teacher in Public Schools of Indiana, 1876-83; and Principal, 1883-85; Indiana State Normal, 1887; A. B., Indiana University, 1888; Principal of Longfellow School, Houston, Tex., 1888-89; Superintendent of Public Schools, Gonzales, Tex., 1889-92.

ARTHUR H. DANIELS, B. D., Millis, Mass., Fellow in Psychology. 1018 Main St.

B. A., Olivet College, 1887; Student at the Yale Divinity School, 1887-90; and B. D., Yale University, 1890; Student of Philosophy and Psychology, Yale University, 1890-92.

ROBERT K. DUNCAN, A. B., Toronto, Ontario, Fellow in Chemistry. 9 Maywood St.

A. B., University of Toronto, 1892. First class honors, Physics and Chemistry.

JOHN E. HILL, Ph. B., Fellow in Mathematics. 44 Richards St.

Ph. B., Yale University, Sheffield Scientific School, 1885; Resident Engineer C. M. and St. Paul R. R., 1885-88; Professor of Mathematics, Louisville Military Academy, Louisville, Ky., 1888-89; Superintendent of Schools, Pleasantville and Pleasantville Station, N. Y., 1889-90; Professor of Mathematics and Civil Engineering, Highland Park College, Des Moines, Iowa, 1890-92.

EDWIN F. NORTHRUP, A. B., Philadelphia, Pa., Fellow in Physics.

A. B., Amherst College, Amherst, Mass., 1891; Post-Graduate Student at Cornell, 1891-92; Resigned the fellowship to accept a position as member of the experimental corps employed by Queen & Co., Philadelphia, 1892-93.

CLARENCE ARTHUR SAUNDERS, M. A., Florenceville,
N. B., Canada, Fellow in Physics. 15 Florence St.

B. A., King's College, Windsor, Nova Scotia, 1885; M. A., Nova Scotia, 1888;
Johns Hopkins University, 1889-92; Assistant to Prof. Langley, Smithsonian
Institution, 1891-92.

J. B. WEEMS, B. S., Solomons, Md., Fellow in Chemistry.
70 Florence St.

B. S., Maryland Agricultural College, 1888; Instructor in Mathematics and
Chemistry, Maryland Agricultural College, 1889; Graduate Student, Johns
Hopkins University, 1889-91.

L. WAYLAND DOWLING, Adrian, Mich., Scholar in Mathe-
matics. 15 Florence St.

Adrian College, 1889-90; Principal of Schools, Clayton, Mich., 1891-92.

FRANK DREW, A. M. 70 Florence St.

Superintendent of Schools, Genoa, Ill., 1887-89; A. B., Indiana University,
1890; A. M., 1891.

BENJAMIN F. ELLIS, A. B., Peoria, Ill., Scholar in Physics.
70 Florence St.

A. B., with honors in Physics, Dartmouth, 1889; Instructor in Physics and
Mathematics, High School, Peoria, Ill., 1889-92.

R. C. HOLLENBAUGH, Ph. D., Williamsport, Pa., Scholar
in Psychology. 14 Crystal St.

A. B., Bucknell University, 1888; A. M., Bucknell University, 1891; Principal
of Cross Creek Academy, 1888-89; Principal of Fultonham Academy, 1889-91;
Ph. D., Wooster University, 1891; Student at Johns Hopkins University,
1892.

HERBERT G. KEPPEL, A. B., Zeeland, Mich., Scholar in
Mathematics. 15 Florence St.

A. B., Hope College, Holland, Mich., 1889; Teacher of Mathematics, North-
western Classical Academy, Orange City, Iowa, 1891-92.

J. S. LEMON, A. M., Gardner, Mass., Scholar in Psychology.
8 King St.

A. B., Wesleyan University, 1864; A. M., 1867; Principal of Brownville High
School, Professor of Physics, Marion Institute, Principal of Almond Colle-
giate Institute, Principal of Macedon Academy, all in New York; since 1880,
Episcopal Rector and Editor of the Religious Department of the *National
Tribune*, Washington, D. C.

JAMES H. LEUBA, B. S., Ph. B., Scholar in Psychology.
8 King St.

B. S., Neuchâtel, Switzerland, 1886; Ph. B., Ursinus College, Pa., 1888;
Teacher of the French Language, St. Mark's School, Southboro, Mass.,
1891-92.

SIDNEY J. LOCHNER, A. B., Lockport, N. Y., Scholar in
Physics. 16 Dale St.

A. B., Union College, 1890; Assistant Astronomer, Dudley Observatory,
1889-92.

JINZO NARUSE.

45 Shelby St.

Yamaguchi Normal School, 1879; Principal of the Public Schools, 1880-81; Teacher of Female Seminary, Osaka City, 1882-86; Pastor of two Christian Churches in Japan, 1886-88; President of Female Seminary of Nūgata City, 1887-90; Andover Theological Seminary, 1890-92.

THOMAS F. NICHOLS, A. B., Brunswick, Me., Scholar in
Mathematics. 4 Lowell St.

A. B., Bowdoin, 1892.

F. E. STINSON, Scholar in Mathematics. 84 Woodland St.

Iowa Agricultural College, 1884-86; Principal of the Poplar Grove (Ark.) Institute, 1889-90; Teacher of Physics and Mathematics, Paris (Ark.) Academy, 1890-92.

EDWARD W. FLAGG, Potsdam, N. Y. 100 Chatham St.

A. B., Yale, 1878; A. M., Yale, 1890; Teacher of English, State Normal School, Potsdam, N. Y., 1883-93.

W. J. WAGGENER, A. M., Boulder, Col., Scholar in Mathe-
matics and Physics.

A. B., State University of Arkansas, 1876, and A. M., 1884; Professor of Natural Philosophy, State University of Colorado, 1885 (to date).

ERVIN W. HOWARD, S. B., Physics (Course d). 279 Pleasant
St.

S. B., Mech. Engineering, 1892; Assistant in Physics, Wor. Polytechnic Institute.

WILLIAM NELSON, S. B., Physics (Course d). 17 Kendall St.

S. B., Mech. Engineering, 1892; Graduate Student in Electrical Engineering, Wor. Polytechnic Institute.

JOSEPH O. PHELON, S. B., Physics (Course d). 8 Dix St.

Instructor in Physics and Electrical Engineering, Wor. Polytechnic Institute.

ARTHUR L. RICE, S. B., Physics (Course d). 689 Main St.

S. B., Mech. Engineering, 1891; Instructor in Mechanical Engineering, Wor. Polytechnic Institute.

STANLEY H. ROOD, S. B., Physics (Course d). 30 John St.

Instructor in Physics, Wor. Polytechnic Institute.

CLAYTON O. SMITH, S. B., Physics (Course d). 206 West St.

S. B., Mech. Engineering, 1892; Assistant in Physics, Wor. Polytechnic Institute.

HUGH M. SOUTHGATE, S. B., Physics (Course d). 23 May St.

S. B., Mech. Engineering, 1892; Assistant in Physics, Wor. Polytechnic Institute.

ADMINISTRATION.

The Trustees are the ultimate source of authority in all matters pertaining to the University. They act collectively, through the three committees named below, and also through the President of the University.

BOARD OF TRUSTEES.

JONAS G. CLARK,

STEPHEN SALISBURY,
GEORGE F. HOAR,
WILLIAM W. RICE,
EDWARD COWLES,

JOHN D. WASHBURN,
FRANK P. GOULDING,
GEORGE SWAN,
THOMAS H. GAGE.

OFFICERS.

President,	-	-	JONAS G. CLARK.
Vice-Presidents,	-	{	GEORGE F. HOAR,
		{	WILLIAM W. RICE.
Treasurer,	-	-	THOMAS H. GAGE.
Secretary,	-	-	FRANK P. GOULDING.

COMMITTEES.

Finance.

JONAS G. CLARK,

JOHN D. WASHBURN,

STEPHEN SALISBURY,

THOMAS H. GAGE.

Buildings.

JONAS G. CLARK,

JOHN D. WASHBURN.

By-Laws.

JONAS G. CLARK.

WILLIAM W. RICE,
JOHN D. WASHBURN,

STEPHEN SALISBURY,
GEORGE SWAN.

PRESIDENT.

The duties of this office were defined by the Trustees, May 23, 1889, as follows :

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University, and attend the meetings of the Board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the Faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

These duties were more fully defined by By-Laws enacted by the corporation, September 26, 1889.

FACULTY.

By action of the Trustees the Faculty Staff has been organized as follows :

I. UNIVERSITY SENATE.

Whose duty it is to elect Fellows and to take action upon general requirements for the Doctor's degree and other promotions, and to act and advise upon matters officially submitted to them.

II. GENERAL FACULTY.

Whose duty it is to consider all matters not otherwise provided for, and in which all departments of the University are alike interested.

III. THE LIBRARY COMMITTEE.

To be appointed by the President or Trustees, the duty of which shall be to advise concerning the arrangement, cataloguing and use of books and other matters pertaining to the library not reserved to the Trustees or otherwise provided for.

GENERAL STATEMENTS.

The University now consists of a group of five closely related departments, in which all its work and that of instructors, fellows, and scholars is grouped. These departments are as follows :

- I. MATHEMATICS.
- II. PHYSICS.
- III. CHEMISTRY.
- IV. BIOLOGY.
- V. PSYCHOLOGY.

In addition to these *Education* is now a sub-department.

ADMISSION.

Only graduate students are admitted, or those of equivalent attainments, unless in rare and special cases. At present no entrance examinations are required, but, by testimonials, diplomas, personal interviews or written specimens of work, the authorities must be satisfied that the applicant has scholarship enough to work to advantage, and zeal and ability enough to devote himself to his chosen

field. The methods of the University are too costly, and its energy and funds too precious to be spent upon men who are not well trained, promising, and in earnest.

It is highly desirable, and will probably before long be required, that candidates entering any of the five departments shall have, besides a knowledge of the other subjects commonly taught in colleges, a reading knowledge of French and German.

For the select students who are received, it is the purpose of the University to open all its privileges, and to supply every incentive possible in the way of books, facilities, and above all, direct personal stimulus and instruction. The chief as well as the best work of this University is individual, and involves daily suggestion, encouragement and direction.

CLASSES OF APPOINTEES.

No clearly marked line exists between students and instructors. Fellows and scholars who have attained some degree of mastery in a special line of work give brief special courses, which are often attended by professors. This is a stimulus to the student, and both tests and exhibits his power in teaching. This and the custom of instructors to

attend each other's lectures, add interest and efficiency to the work of the University.

I. DOCENTS.

The highest annual appointment is that of Docent. These positions are primarily honors, and are reserved for a few men whose work has already marked a distinct advance beyond the Doctorate and who wish to engage in research. They are not assistants, and their relations are directly with the President of the University.

Docents may be provided with individual rooms, and special apparatus may be purchased for their work if desired and approved. While they will be expected to deliver a limited number of lectures on some special chapter of their department, their time will be mainly reserved for study and research in a way best adapted to qualify them still more fully for academic advancement.

These positions are now official appointments. Appointees, or others found worthy, however, may be formally invested with the *licentia docendi*, the terms of which can now be furnished on application and which requires a memoir or essay representing original work in their own department, but no examination. This highest formal academic honor will be strictly reserved for those of marked

scientific attainment and teaching ability, and so far as this diploma can have the significance of a title or degree, it will be regarded by the University as a brevet collegiate professorship.

It is believed that by the existence of such a select body of men of guaranteed scientific training, ability and approved power to teach, the difficulties under which college trustees sometimes succumb in selecting suitable men for their professors may be diminished, and that otherwise this new grade will aid in raising standards of academic scholarship in colleges and in encouraging scientific research here. Good men of this class may be paid a salary.

II. CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

In most cases it is probable that three, or at least two, years of graduate work will be necessary for this degree. Examinations for it, however, may be taken at any time when, in the judgment of the University authorities, the candidate is prepared. A pre-arranged period of serious work at the University itself is indispensable.

For this degree the first requirement is a thesis upon an approved subject to which it must be an

original contribution of value. To this capital importance is attached. It must be reported on in writing by the chief instructor, printed at the expense of the candidate, and at least one hundred copies given to the University. In case, however, of theses of very unusual length, or containing plates of unusual expensiveness, the academic Senate shall have power, at the request of the candidate, to reduce this number of presentation copies to 50. Each of these copies shall bear upon it in print, the statement of the chief instructor, that it is a thesis for the Doctor's degree in his department at Clark University.

Such formal or informal tests as the academic Senate shall determine shall mark the acceptance of each student or fellow as a candidate for this degree.

One object of this preliminary test shall be to insure a good reading knowledge of French and German. Such formal candidature shall precede by not less than three months and not more than one year the examination itself, and the nature and result of this test shall be made matter of record.

The fee for the Doctor's degree is \$25, and in every case it must be paid and the presentation

copies of the thesis must be in the hands of the Librarian before the diploma is given. In exceptional cases, however, and by special action of the Senate, the ceremony of promotion may precede the presentation of the printed copies of the thesis. The latter, however, must always precede the actual presentation of the diploma.

An oral but not a written examination is required upon at least one minor subject in addition to the major, before an examination jury, composed of at least four members, including the head of the department and the President of the University, who is authorized to invite any person from within or without the University to be present and to ask questions. The jury shall report the results of the examination to the Senate, who, if they are also satisfied, may recommend the candidate for the degree.

For the bestowal of this degree, the approbation of the Board of Trustees must in each case be obtained. They desire that the standard requirements for it be kept the highest practicable, that it be reserved for men of superior ability and attainment only, and that its value here be never suffered to depreciate.

It is to the needs of these students that the lectures, seminaries, laboratories, collections of books,

apparatus, etc., are specially shaped and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the Fellowships and Scholarships are primarily intended, although any of these honors may be awarded to others.

III. SPECIAL STUDENTS NOT CANDIDATES FOR A DEGREE.

Any one desiring to undertake a special and approved line of research and whose attainments are such as to satisfy the requirements of the University, may also be received. This class includes those who may desire to devote themselves exclusively to one or more of the special branches—mathematics, physics, chemistry, biology, psychology, or education—but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of the departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects), may be allowed entire freedom in their choice and combination of studies, and as special students may enjoy all the privileges of the University.

These students may, with the approval of the President, be received for less than an entire year.

IV. PRELIMINARY CANDIDATES.

Non-university students of less special, or less advanced standing than the above three classes, who are nearly, if not quite, qualified to become candidates for the degree of Doctor of Philosophy, may also be received.

Students of this class must for the present have completed the work of the first three years of a regular under-graduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University of their attainments, and that they contemplate advancing to a degree higher than that of A. B. The privileges and status of these students will be more fully defined later. They may in exceptional cases be elected to Scholarships.

THE CLARK FELLOWSHIPS AND SCHOLARSHIPS.

10 Fellowships of \$600 per year.

10 Fellowships of \$400 per year.

10 Scholarships of \$200 per year.

In general these appointments may perhaps represent the successive stages of approximation to the Doctor's degree, the highest priced Fellowships be-

ing for men within a year of that degree, the next for those within two years of it. Those who have already taken the Doctor's degree or those not intending to do so, may be appointed to fellowships and Scholarships. *The tuition fee, which is included in the above sums, will be deducted.*

The founder of the University and his wife unite with the Trustees and President in inviting sympathy and practical co-operation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

A CITIZEN'S FUND.

In addition to this a citizen of Worcester has given a fund of \$5,000, the income of which is to be used for the aid of "some one or more worthy native born citizens of the city of Worcester who may desire to avail themselves of the advantages of the institution."

THE FIELD FUND.

Mrs. Eliza W. Field has also given \$500, to be called the "John White Field Fund," the income of which is "to provide for the minor needs of a Scholar or Fellow."

PURPOSE AND CONDITIONS OF FELLOWSHIPS AND SCHOLARSHIPS.

Fellowships at Clark University are intended for young men of promise who desire to pursue post-graduate studies in order to fit themselves for intellectual careers. It is desirable, but not required, that candidates for these positions should intend to proceed to the degree of Doctor of Philosophy or to equivalent attainments. In general those intending to devote themselves to some special branch of learning are preferred to those directly fitting themselves for one of the three learned professions, although the latter are not excluded.

Applications should state the candidate's course of study and be accompanied by testimonials or diplomas, should indicate a decided preference for some special department, and if possible be accompanied by some specimen of his work for the aid of the Board of Selection. Applications will be considered in June and in October, and should be in the hands of the President on or before the first of these months. In special cases vacancies may be filled by appointments at any time during the year. The names of unsuccessful candidates will not be made public.

Fellows must reside in Worcester during the entire academic year and devote themselves to special studies under the direction of their instructors and give such evidence of progress or proficiency before the end of the year as the authorities shall require. It is generally expected that they will undertake some work of research during the year. They must co-operate in promoting harmony, order and all the ends of the University, must not teach elsewhere and may be reappointed at the end of the year. Because intended primarily as honors, both Fellowships and Scholarships are awarded without reference to pecuniary needs, so that those able and desiring to do so may relinquish the emolument and retain the title of "Scholar" or "Fellow."

Both Scholarships and Fellowships are open only to students in one or more of the five departments announced.

METHODS.

Besides field work, excursions to institutions public and private, coaching and cram-classes, clubs, examinations, conferences and other modes by which knowledge now seems best imparted and retained, the following educational methods are prominent:

LECTURES. The Trustees desire that each instructor of however few students, should prepare and deliver regular lecture courses, with diagrams, illustrative apparatus and references to standard text-books, and the best current literature upon each topic. Advanced students are also encouraged to supplement the work of the professors by giving occasional special lectures and courses. Public lectures will from time to time be given.

SEMINARIES. These are stated, perhaps weekly, meetings for joint, systematic work, under the personal direction of the professor, in some special part of his subject. Here the results of individual reading are reported for the benefit of all; views are freely criticised; new inquiries, methods, comparisons, standpoints, etc., suggested. From the mutual stimulus thus given many important works have proceeded, and the efficiency of universities has been greatly increased.

LABORATORY WORK. For beginners this was from the first the best of all forms of apprenticeship, bringing student and professor to a closer and mutually stimulating relation. Here the manipulation of apparatus is learned, processes are criticised, results obtained by other investigators are tested, methods discussed and perfected, with a view to developing that independence in re-

search which is the consummation of scientific culture.

NOTICES.

The charge for tuition, giving all the privileges of the University, but not covering the laboratory fees, is \$200 per annum ; but special arrangements may be made with individuals who are not under appointment as Scholars or Fellows.

Board and lodging can be obtained near the University at very moderate rates.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk of the University, L. N. Wilson, Worcester, Mass.

DEPARTMENTS.

The statements of the instructors concerning the courses to be given during the academic year 1893-94, which follow, are supplemented by a fuller account of the past and present work of each department contained in the third Report of the President and Departments, April, 1893.

Further announcements may be made later.

I.

MATHEMATICS.

PROGRAMME FOR 1893-94.

Beginning with the academic year 1893-94, the introductory courses will be given in alternate annual groups, as follows:

GROUP A (to be given in alternate years, beginning with 1894-95).

ANALYTIC GEOMETRY OF CONIC SECTIONS, QUADRIC SURFACES AND HIGHER PLANE CURVES; 3 hours a week, through the year.

THEORY OF FUNCTIONS OF REAL AND IMAGINARY VARIABLES AND DEFINITE INTEGRALS; 3 hours a week, through the year.

THEORY OF NUMBERS; 2 hours a week, first half-year.

MODERN SYNTHETIC GEOMETRY; 2 hours a week, second half-year.

GROUP B (to be given in alternate years, beginning with 1893-94).

ANALYTIC GEOMETRY OF CONIC SECTIONS, QUADRIC SURFACES AND HIGHER PLANE CURVES; 3 hours a week, through the year.

ELLIPTIC FUNCTIONS, DIFFERENTIAL EQUATIONS AND CALCULUS OF VARIATIONS; 3 hours a week, through the year.

ALGEBRAIC SUBSTITUTIONS AND THEIR APPLICATIONS TO THE THEORY OF EQUATIONS; 2 hours a week, first half-year.

ANALYTIC GEOMETRY OF HIGHER SURFACES AND TWISTED CURVES; 2 hours a week, second half-year.

ALGEBRAIC INVARIANTS; 2 hours a week, first half-year.

It will be observed that the first course in each group is the same; that course alone is repeated annually, while the other courses are given but once in two years. It is expected that every student will take each course (unless he has already completed an equivalent course elsewhere) in the earliest year of his residence in which it is given. These courses are briefly described in the Third Report of the President and Departments (April, 1893). Their chief object is to make the student familiar with the various methods of mathematical research and the concepts of mathematical thought at the present day. Thus, for example, the conic sections and quadric surfaces are treated by modern methods from the beginning, with adequate consideration of the discoveries of the great geometers of recent times; the usual college courses in these subjects furnish the necessary preparation for the courses here given.

A *Seminary* will be conducted in connection with each group, in which the students will be exercised in individual investigation and the oral presentation of results. The literature of the topics considered will here receive adequate attention.

Special advanced courses, open to such as have nearly or quite completed the introductory courses, are given annually in subjects varying with the interests of the instructors and the needs of the students.

For 1893-94, advanced courses are offered as follows:

BY PROFESSOR STORY :

TWISTED CURVES AND TORSES; 2 hours a week, first half-year.

HYPERSPACE AND NONEUCLIDEAN GEOMETRY; 2 hours a week, second half-year.

ENUMERATIVE GEOMETRY; 2 hours a week, first half-year.

BY ASSISTANT PROFESSOR TABER :

QUATERNIONS; 2 hours a week, first half-year.

FINITE DIFFERENCES AND PROBABILITIES; 2 hours a week, second half-year.

BY M. DE PEROTT :

THEORY OF NUMBERS; 2 hours a week, second half-year.

Each advanced student will be placed under the supervision of one of the instructors for guidance in original investigation of some special topic; the successful issue of this investigation may furnish material for the dissertation required of a candidate for the degree of Doctor of Philosophy.

If it is desired, Dr. Taber may give a course of lectures on the Elements of the Infinitesimal Calculus, the Theory of Probability, and the Method of Least Squares, with applications to statistics. These lectures are designed for students of the non-mathematical courses; the aim will be to give such students a working knowledge of the subjects sufficient to enable them to deal intelligently with the problems that arise in the ordinary course of experimentation. The course may be extended to include the theory of induction and its relations to the theory of probability.

For further details concerning the department (members and courses of instruction for the last four years; general policy of the department; library facilities and apparatus), see the *Third Report of the President and Departments*, pp. 17-63.

II.

PHYSICS.

Instruction in this department will be given by ARTHUR G. WEBSTER, Ph. D., Assistant Professor of Physics.

The aim of the department is to ensure in the students some acquaintance with all the various fields of experimental physics, to develop in them the power of exact measurement, to accustom them to exact reasoning from experiment to theory, and to encourage original research conducted on a sound basis. To this end students will be put to work in the laboratory upon experiments of sufficient difficulty to give them skill in measurements of precision, and enable them to become familiar with the precautions and corrections necessary to be employed in exact work. After a sufficient amount of experience has been gained, and the student has shown himself to be possessed of sufficient originality to warrant independent investigation, he will be encouraged to take up for himself an original research in the hope of making a personal contribution to science. In this research, he will at all times have the benefit of the direction and advice of the instructor.

In the belief that no sound knowledge of physics is at the present day possible without a clear appreciation of the means of expressing facts in accurate form, from which exact reasoning is possible, much stress is laid on the acquisition of familiarity with the application of mathematical analysis to physics, and the courses of lectures are shaped with that end in view. These aim to give the student some acquaintance with the whole field of theoretical physics, to familiarize him with those general methods that appear in the various branches, and to show him how he may avail himself of them in practice. It is the constant endeavor in the lectures to bring out the physical essence that is concealed in the formulæ, in order that the student may recognize not merely the formula, in whatever department of physics it may occur, but the physical truth involved. As an instance, may be mentioned the treatment of the partial differential equation of Laplace, whose meaning, whether in connection with distributions of Newtonian force, with the steady flow of heat, the steady flow of electricity, certain cases in hydrodynamics and sound, or in the theory of magnetic and electric induction, is physically the same, and indicates what was termed by Faraday the tubular, or solenoidal distribution of a vector. Further examples are furnished by the geometrical properties of linear vector functions, of so frequent occurrence, and by the properties of such vector functions that one represents the "spin," or "rotation," of another.

Before all things, however, are made prominent the idea of Energy and its laws, so that in each department the subject is developed as far as possible from the mathe-

mathematical expression of the energy involved. Physics may be defined as the Science of Energy, and it is attempted, so far as possible, to make each portion of mathematical physics depend upon simple dynamical principles.

The following courses of lectures will be given, repeated at least as often as once in three years, the time that will ordinarily be required for the attainment of the doctor's degree.

(a) DYNAMICS, GENERAL METHODS, SYSTEMS OF PARTICLES, RIGID BODIES.

(b) ELASTICITY, HYDRODYNAMICS, VIBRATORY MOTIONS, SOUND, LIGHT.

(c) OPTICS, PHYSICAL AND GEOMETRICAL.

(d) POTENTIAL, ELECTRICITY AND MAGNETISM.

(e) FLOW OF HEAT AND ELECTRICITY, THERMODYNAMICS, KINETIC THEORY OF GASES, CAPILLARITY.

(f) THE PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS AND THE ARBITRARY FUNCTIONS ARISING IN CONNECTION WITH THEM.

The courses for the year 1893-94 will be (c), (e), and probably (f).

In addition to the above courses, there has this year been established a Colloquium, or meeting for the informal discussion of subjects not treated in the lectures, and for the presentation of summaries of important articles appearing in the journals, thus furnishing an important means of keeping in touch not only with what has been done, but with what is being done in the various parts of the world in the domain of physics. These meetings have been frequently attended by members of other departments.

It should be urged upon intending students to prepare themselves, not only in ordinary laboratory measurements, but also in mathematics, the lack of proper mathematical preparation being a serious drawback to the appreciation of the lectures. In particular may be commended for study not merely those portions of the Calculus which deal with the working out of many indefinite integrals, etc., but the theoretical portions which deal with the ideas of partial derivatives, definite integrals, and their practical manipulation, together with enough analytic geometry to involve the properties of lines and *surfaces* of the second order, and a fair amount of the elements of determinants.

A fuller account of the above courses of lectures, as well as a description of the facilities of the department, and a statement of the requisitions for the doctor's degree, may be found in the *Report of the President and Departments* for 1893.

III.

CHEMISTRY.

The Department of Chemistry offers to the student who is fully prepared to begin graduate work, a series of regularly recurring laboratory and lecture courses, so combined with special advanced courses of a less permanent character that all graduate subjects required in the examination for the doctor's degree will be presented within the space of two years. The laboratory courses and lectures on Organic and some branch of Theoretical Chemistry will be given each year. The special courses, which will include such subjects as Analytical, Inorganic and Physiological Chemistry, Crystallography, and "Special Topics," will be different on different years and cannot always be announced long in advance.

LECTURE COURSES FOR 1893-94.

I. (a) ORGANIC CHEMISTRY.—Methods of organic analysis and molecular-weight determination, physical properties of organic compounds, the chemistry of the fatty series in detail, the polymethylenes, the thiophene group and the simpler derivatives of benzene. Two lectures a week for one-half year, 1893-94.

(b) ORGANIC CHEMISTRY (advanced course).—The chemistry of complex aromatic rings, including the quinoline and

pyridine groups. This is a continuation of last year's lecture course on organic chemistry and also supplements, I. (a). Two lectures a week for one-half year, 1893-94.

Courses I. (a) and I. (b) will be combined to form a single course of two hours a week during the year 1894-95.

II. HISTORY OF CHEMISTRY SINCE LAVOISIER.—One prominent feature of this course will be a careful study of the evolution of the theories in regard to chemical constitution of compounds since the formation of Dalton's atomic hypothesis. The library facilities are such that it will be generally possible in the seminary work to illustrate the condition of chemical theory at different periods by a study of original memoirs. Lectures or seminary work once a week during the year 1893-94.

III. PHYSICAL CHEMISTRY.—A course of lectures on this subject will, if possible, be offered at least every other year.

IV. SELECTED TOPICS IN ADVANCED CHEMISTRY.—Once a week during the year 1894-95.

V. Journal meetings for reporting and informally discussing important work appearing in the current chemical literature will be held once a week throughout each year.

LABORATORY COURSES.

Although as a rule only such men will be admitted to this department as have already completed a good college course in Chemistry, and are practically acquainted with the ordinary analytical methods, since the majority of our colleges do not yet give sufficient training in the methods employed in making organic preparations and analyses to render it possible for their graduates to begin upon research work immediately, the following introductory laboratory courses (VI.),—which are also suitable for minor subjects,—have been instituted, and are offered yearly :—

- VI. (a) GENERAL EXPERIMENTAL INORGANIC CHEMISTRY.
(b) ANALYTICAL CHEMISTRY.—Qualitative and quantitative.
(c) MOLECULAR-WEIGHT DETERMINATIONS.
(d) ORGANIC PREPARATIONS.

VII. CHEMICAL RESEARCH.—As soon as a student has obtained the necessary preliminary training in the subjects represented in course VI., he may at once begin upon some scientific research under the direction of an instructor. The subject chosen for investigation may originate with the student, or may be proposed by an instructor; but must be one that meets the approval of the head of the department. When sufficient material for a satisfactory dissertation has been collected and the other requirements have been fulfilled, the candidate for the degree of Ph. D. may present himself for examination. The time required for this course varies much with different students, but is usually about two years, when 30-40 hours are spent in the laboratory each week.

The laboratory and library are open at all hours during the day, and afford every facility for advanced work. An account of the past work and present facilities of the Chemical Department may be found in the "Report of the President and Departments of Clark University," for 1893, pp. 79-90.

IV.

BIOLOGY.

PROGRAMME OF WORK FOR YEAR 1893-94.

DR. HODGE will offer the following courses :

I. GENERAL BIOLOGY.—It is intended in this course to outline the principles of biological science. The most general classification of plants and animals will be given with description of structural and physiological characteristics in a series of typical organisms. The topics, organization, growth and reproduction, specialization and evolution will be given special prominence throughout the course. One lecture weekly, October to January. Laboratory work, six hours weekly, to be arranged to meet the requirements of those taking the course.

II. COMPARATIVE STUDY OF NERVOUS SYSTEMS AND SENSE ORGANS.—The point of view in this course will be both anatomical and physiological. It will begin with a study, as far as possible comparative, of the structural elements of the nervous system in both invertebrates and vertebrates. Following this it is proposed to consider the structure and functions of the nervous system in a series of animals, beginning with the cœlenterata and ascending through the mollusca, vermes, tunicata, arthropoda, and vertebrates. The course will be fully illustrated by diagrams, models, dissections, and experiments. It is also intended to so arrange portions of courses I. and II. as to fill out on the biological side the course

in comparative psychology and psychogenesis to be given by Dr. Sanford. One lecture weekly throughout the year.

PHYSIOLOGY AND NEUROLOGY.

The courses in physiology are arranged in such a manner that the general field may be covered in two years. This scheme will leave the student free to devote his entire time during the third year to special study in the literature of the science and to the prosecution of original research.

The general subject will include lectures, reading courses, seminars, demonstrations, and laboratory work in the following lines :

1. Muscle and nerve.
2. Circulation, respiration, digestion, nutrition and excretion.
3. Brain.
4. Skin and sense organs.
5. Reproduction.

During the work in each of the above divisions, the microscopical structure of the organs concerned as well as the physiological chemistry connected with their action, will receive especial attention.

During the year 1893-94 a course supplementing course II., or it may be taken independent of it, will be offered in :—

III. MUSCLE AND NERVE PHYSIOLOGY.—This course will include reflex action. It will extend from January to May, with lectures, demonstrations, and laboratory work arranged to meet the requirements of students taking the course.

By way of supplementing the above courses and courses in other departments of the University, a number of special courses have been planned as follows :

IV. EMBRYOLOGY OF THE HUMAN BRAIN AND SENSE ORGANS.—Six lectures, with demonstrations and literature. special prominence will be given to the growth of the brain in children in connection with the course in Motor Education to be given by Dr. Burnham.

V. HISTORY AND PRESENT STATUS OF CEREBRAL LOCALIZATION.—Six lectures with specimens for demonstration and repetition of classical experiments. It is intended to give this course toward close of year, after course III. has been completed.

VI. PRACTICAL HISTOLOGY OF THE NERVOUS SYSTEM.—The course will be purely a laboratory course, with such lectures, directions and conferences as may be required by those taking it. Considerable latitude will be given, so that any who wish may make it a comparative study by way of supplementing course II. or devote their time to special problems.

EXPERIMENTAL WORK.

Laboratory work in physiology and neurology will be arranged to suit the needs and purposes of members of the department. As soon as practicable each student will be expected to undertake an original research. It is to be hoped that men coming to the laboratory to study will have problems in which they are already interested. In case, however, they have not, work will be assigned. A considerable amount of valuable material has already accumulated in the laboratory, and is waiting to be worked up. A course in Biology, such as is now given in the undergraduate department of our colleges and state

universities, will fit students to begin the laboratory work here.

Laboratory facilities and equipments are of the best. Library advantages are also good. For fuller information on these points the reader is referred to the *Report of the President* for 1893, which will be furnished upon application.

In connection with the above courses it is intended to hold weekly, if possible, journal club meetings for the purpose of reporting and discussing important articles in the current periodicals.

V.

PSYCHOLOGY.

A complete course in Psychology at Clark University includes the following subjects :

I. Anatomy and physiology of the brain and spinal cord; senses; and other parts of the body, especially the muscles; the organs of the will, so far as they affect psychological powers and processes. For this a special laboratory is equipped. See Dr. Hodge's announcement.

II. Physiological and experimental psychology, including Reflex Action; Fatigue and Rest; Sleep; Hypnotism; Automatism; Temperaments; Interaction of mind and body generally. Laboratory methods and apparatus for the study of the Senses, Reaction-Times, Memory and Attention. For this a special laboratory is equipped. See Dr. Sanford's announcement.

III. Abnormal and morbid psychology, as nature's experiments, *e. g.*, border-line phenomena as seen in neurotic people, prodigies and geniuses; Defectives, such as the blind, deaf, criminal, idiotic; Mental and nervous diseases, epilepsy, phobias, neurasthenia, hysteria; Morbid modifications of will, personality and emotion, etc. Special clinical facilities for this work are open to the department in the hospitals and other institutions of the city. See Dr. Hall's clinic and lectures below.

IV. Anthropological psychology; Myths, Custom and Belief, Comparative Religion and Psychology of Religion, Prim-

itive Art, and the study of the life of savages and children; Adolescence and senescence; physical measurements illustrating laws of growth in size and power, &c. See Dr. Chamberlain's laboratory and courses.

V. *Æsthetics and Ethics*, the psychology of music, painting, literature, the phenomena and laws of volition and morality. Mr. Gilman has represented the first part of this work during the present year.

VI. History of psychology and philosophy, including the chief culture institutions, science, medical theories, Christianity, and education generally. Dr. Hall's course.

VII. Applications of psychology; pedagogy, including mental and moral hygiene and regimen, school organization and methods from kindergarten to university; the sexual problem; defectives, etc. Dr. Hall's and Dr. Burnham's courses.

The aim of the Psychological Department is to cover this field as well as its instructors are able to do in two or three years.

For a full statement of what has been done in this department from the opening of the University down to the present, see the *Report of the President and Departments*, April, 1893.

During the academic year 1893-94, the following courses will be given :

DR. G. STANLEY HALL'S COURSES.

A. HISTORY OF PSYCHOLOGY AND PHILOSOPHY from the beginning of the scholastic period to the present. This course is a continuation of the course on Ancient Psychology and Philosophy given during the present year. It will include medical, scientific and educational theories, and a discussion of contemporary writers. The efficient coöperation of Mr. S. S. Green, librarian of the Public Library, has been very helpful to

this course during the present year and is assured for the future. Four times weekly throughout the year.

B. ABNORMAL PSYCHOLOGY.—This will be a general presentation of the entire field, with special emphasis upon such points as are of value for special students of psychology. One hour a week throughout the year.

C. THE PSYCHOLOGY AND PHILOSOPHY OF EDUCATION.—This course will present the general field with as much completeness and connection, and with such historical matter and practical application, as the lecturer is able. One hour a week throughout the year.

D. CONFERENCES will be held in the President's library Monday evenings, as during the present year, for reading, discussion, etc. One three hour session weekly.

E. SATURDAY AFTERNOON CLINICS will be held at the Hospital for the Insane, or during the latter part of the present year. Visits to other institutions, educational, penal, etc., in Worcester and Boston, will also be made weekly during a part of the year.

F. STUDENTS' LECTURE COURSES.—Students are expected to give one or more lectures, open to members of the University, upon topics to which they have given chief attention during the year. These courses have been both valuable and attractive.

DR. E. C. SANFORD'S COURSES.

G. A GENERAL COURSE OF LECTURES AND DEMONSTRATIONS.—The aim of this course will be to present in a concise form the present aspect of the psychological field in general. The senses, psycho-physic law, reaction-times, association, memory, attention, volition, illusions, sleep, dreams, space, time, and feeling, will be treated, not however, as separate topics, but in their proper perspective and from the standpoint of psychological science. This course will be illustrated as fully as possible with charts and apparatus. One hour weekly throughout the year.

H. A PRACTICUM in connection with course G will be conducted by a competent demonstrator (to be appointed). The apparatus and the methods referred to in the lectures will be explained to the students, and they will be personally instructed in handling them. Weekly for the first half year. Courses G and H are intended for all those generally interested in psychology, and in particular for those taking psychology as a minor subject, or as subsidiary to pedagogy, or the history of philosophy.

I. AN ADVANCED COURSE, intended for those whose major interest is in psychology. This will consist of a number of short courses upon special topics, as follows: Comparative Psychology and Psychogenesis, parallel to the course of Dr. Hodge on Comparative Neurology; Relations of Psychical Action to Circulation and Respiration; Psychology of Laughter and Humor; A Psychological Laboratory and its Equipment. In addition to these, courses may be given on Personal Equation and Errors of Observation (in which members of other departments may be interested), and on Leading Psychologists of this Century. One hour a week throughout the year.

FIRST YEAR'S LABORATORY WORK.

J. The laboratory will be open only to those whose chief interest is in psychology. The work at first will be calculated to introduce the student to the most important instruments and methods. As soon as expedient, however, the student will be encouraged to undertake original work in coöperation with the instructor. It is believed that by a system of scientific apprenticeship, the student may safely do this at an early stage of his course, and that the intimate contact of instructor and student will reach the very best pedagogical results.

K. SEMINARY AND JOURNAL CLUB.—A seminary or journal club, or both, may be organized during the year.

DRS. HALL AND SANFORD.

L. ADVANCED LABORATORY WORK.—This work is in all cases undertaken under the personal guidance of the instruct-

ors, the aim being to suggest to each man that problem that will be best adapted to his special needs and abilities. The laboratory will be open for this advanced work of research at such times as are convenient to those engaged in it.

DR. CHAMBERLAIN'S COURSES.

M. GENERAL, embracing: (a) HISTORY, scope and relations of the science of Anthropology. (b) PHYSICAL ANTHROPOLOGY. Problems, investigations, results, laboratory work. (c) ETHNOGRAPHY. Races and race-origins. (d) ETHNOLOGY, including sociology; origin and development of the arts and sciences; mythology; folk-lore; religions. (e) LINGUISTICS. Race and language. Origin and development of language and of languages. Psychology of language. Gesture-speech and written language. Comparative linguistics. Comparative literature. (f) CRIMINAL AND PATHOLOGICAL ANTHROPOLOGY. Ethnic morals. (g) HISTORICAL AND ARCHEOLOGICAL. Primitive man and primitive culture. One hour a week throughout the year.

N. A SPECIAL COURSE ON: The Folk-lore and Mythology of Ancient Greece and Rome in the Light of Modern Comparative Research.

O. A SPECIAL COURSE ON: Life and Education of Children amongst Primitive Races, especially the American Indians.

The lectures in anthropology will have special bearing upon the courses in psychology and pedagogy in the University, as may be seen from the outline given above.

From time to time reviews of the most important current literature will be made and students acquainted with the best contributions to anthropological science in the various foreign languages.

For details concerning all the work in the Department of Psychology from the opening of the University to the present time, including laboratory equipment, library facilities, publications, including the *American Journal of Psychology*, edited in the department, etc., see the *First Triennial Report of the President and Departments*, April, 1893.

VI.

EDUCATION.

This has been made a sub-department and now offers a course which can be taken as a minor for the degree of Doctor of Philosophy. Its work is in the closest connection with the work in psychology and anthropology, and in part based on these. The work in this department is intended to meet the needs of the following classes of men :

First. Those intending to teach some other specialty, but who wish a general survey of the history, present state, methods, and recent advances in the field of university, professional, and technical education.

Second. Those who desire to become professors of pedagogy, or heads or instructors in normal schools, superintendents, or otherwise to become experts in the work of education.

The programme of the Educational Department includes courses upon the following subjects :

I. (a) CHILD STUDY. (b) EDUCATIONAL PSYCHOLOGY. (c) SCHOOL HYGIENE.

II. (a) PRINCIPLES OF EDUCATION. (b) HISTORY OF EDUCATION AND REFORMS. (c) METHODS, DEVICES, APPARATUS, ETC.

III. (a) ORGANIZATION OF SCHOOLS IN DIFFERENT COUNTRIES. (b) TYPICAL SCHOOLS AND SPECIAL FOUNDATIONS. (c) MOTOR EDUCATION, including manual training, physical education, etc. (d) MORAL EDUCATION. (e) IDEALS.

IV. HIGHER EDUCATION, including university work, technical education; training in law, medicine, and theology; recent progress, present state and prospects of the most advanced education in different countries, including our own.

The courses in education for 1893-94 will be as follows :

DR. G. STANLEY HALL'S COURSES.

(A) PRESENT STATUS AND PROBLEMS OF HIGHER EDUCATION IN THIS COUNTRY AND EUROPE. One hour weekly, half a year.

(B) OUTLINE OF SYSTEMATIC PEDAGOGY. One hour weekly, half a year.

DR. BURNHAM'S COURSES.

(C) ORGANIZATION OF SCHOOLS IN EUROPE, especially the schools of France, Germany, Sweden and England. Typical schools will be described and educational principles illustrated by them will be expounded and discussed. References will be made to important literature, and the work may serve as an outline for further study. One hour a week, half a year.

(D) SCHOOL HYGIENE, following and supplementing his "Outlines of School Hygiene," and considering special topics. One hour a week, half a year.

(E) EDUCATIONAL REFORMS, involving the discussion of a few fundamental educational principles and the presentation of chapters in the history of education. One hour a week, half a year.

(F) MOTOR EDUCATION OF CHILDREN. This course will endeavor to elucidate the principles that should govern this side

of education, and will involve the study of writing, drawing, manual training, and of play and gymnastics as means of motor education. The course may include also the study of motor training and muscular development in relation to intellectual ability and moral character. One hour a week, half a year.

(G) The work of the *Seminary*, once a week throughout the year, will be, for the most part, adapted to individual students. It is hoped that each student will select, after conference with President Hall and Dr. Burnham, a topic for special investigation. The results of such study may be published.

The courses as announced above may be modified somewhat as the needs of the students or other circumstances may require.

The library of the department is especially rich in foreign educational literature, and considerable illustrative apparatus has been collected. The Worcester Public Library and the library of the American Antiquarian Society are also accessible to students.

The *Pedagogical Seminary* is published by this department and offers facilities for printing digests, reviews and more valuable papers prepared by the members of the department.

For a fuller account of the facilities and history of this department, see the *Report of the President and Departments*, 1893.

LIBRARY.

The University Library now contains 15,500 bound volumes and 1,500 pamphlets, and the reading room receives 239 journals. With the exception of 3,200 Congressional publications and other contributed volumes, the library and the journals represent chiefly the five departments.

The books are grouped as follows :

A	WORKS OF GENERAL REFERENCE.	I	PSYCHOLOGY.
B	JOURNALS.	J	PHILOSOPHY.
C	MATHEMATICS.	K	ETHICS.
D	PHYSICS.	L	CRIMINOLOGY.
E	CHEMISTRY.	M	ANTHROPOLOGY.
F	ZOÖLOGY.	N	EDUCATION.
G	PHYSIOLOGY.	O	BOTANY.
H	PATHOLOGY.		

Books not included under any of these subjects are grouped as Miscellaneous, and marked according to their room, case, tier and shelf. They comprise in addition to Congressional publications, bound files of magazines, several score of rare old books, a collection of art publications, travels, complete works, sets of reports, histories, biographies, etc.

The library of the University at present consists of six rooms. I. The large general room, containing A,

B, C, D, F, G, H, I, J, K, L, M, and O. II. The journal room. This contains chiefly current numbers of journals and books of reference. The journals are arranged on broad shelves on each side of the room for ready inspection. III. The educational room. This contains all the educational works except state and city reports and college publications, which have a place and a catalogue by themselves. IV. Chemical Library room, containing both the books and periodicals in that department and labeled E. V. A small store room for books not yet placed on the shelves or catalogued. VI. A small room for duplicates, unbound copies of journals, etc. Besides the subject classification, books are arranged in cases, tiers, shelves, etc.

All the privileges of the library are open to all appointees of the University alike.

The library is open from 8 A. M. to 6 P. M., and each member of the University has direct access to every book and journal.

Outside the University are found :

The Library of the Antiquarian Society, organized in 1812, containing 90,000 volumes, and which is accessible to all members of the University.

The Worcester Public Library, containing about 360 periodicals and 86,000 volumes, has supplemented the scientific publications purchased by the University and all the privileges are accessible without charge.

A Medical Library of 8,000 volumes is also accessible.

By the courtesy of the Librarian of Harvard University and of the Surgeon General at Washington, books from both these institutions are sent to the University

for a limited time, and by the courtesy of S. S. Green of the Worcester Public Library, all the resources of that institution and its facilities for borrowing from distant libraries are available to all members of the University.

LIBRARY RULES.

1. No loud talk is allowed in any part of the library or reading room.

2. Every book shall be returned at the end of three weeks from the time at which it was taken out; at this time it may be renewed for three weeks, unless wanted.

3. Any book may be called in at three days' notice at the discretion of the Secretary of the Library Committee.

4. Any member of the staff may reserve from circulation such books as he deems necessary in connection with the courses given in his department; and these shall be placed by themselves and marked "reserved."

5. Current numbers of periodicals shall not be taken out until they have been in the library two weeks.

6. Reserved books and current numbers of periodicals, exempt from circulation, may be taken out after 5.30 P.M., but must be returned before 9 o'clock the next morning, excepting that such books and periodicals may be taken out on Saturdays at 12 M. and may be kept until 9 o'clock the next Monday morning.

7. All dictionaries, cyclopædias, and books of general reference, are permanently reserved.

8. Books of great value may be taken out only by special permission.

BY-LAWS.

The President of the University shall preside on all public academic occasions, shall direct the official correspondence, study the wants and interests of the whole University and exercise a general superintendence over all its concerns. His first care, and that of the authorities of the University, shall be the departments already established, and next those closely related to them ; but no other department shall be established until those already introduced have been brought to the highest state of efficiency then possible. All acts, however, which shall involve the expenditure of money in the administration of the University's affairs, shall be subject to the approval of the Board of Trustees or the Finance Committee for the time being.

As the efficiency of the University depends chiefly upon the quality of its Faculty, the Board of Trustees will hold the President to a strict but reasonable accountability for the fidelity and ability of each instructor. The President only shall have the power to select and appoint all officers of instruction, subject to the approval of the Board of Trustees. To make wise and well considered

appointments, to maintain harmony within the Faculty and to increase their efficiency in research and instruction, shall be his most important duty. If at any time the President shall be negligent in the discharge of these or other duties, or is from any cause disabled from discharging them, they may be exercised by the Board of Trustees.

The President of the University shall be the medium of communication between the Trustees and instructors, individually and collectively, upon all matters within the field of action of either body. He shall attend all meetings of the Board of Trustees, of which he shall be notified, and shall participate in their deliberations, but without the power to vote. All complaints and requests from members of one body to the other shall be made through him.

The President shall call and preside over all official meetings of the instructors, and a record of their proceedings shall be kept. These records are in no case to be made known to others than the Trustees. They shall always be in the custody of the President, but may be inspected by the Trustees, or either of them at any time.

The President of the University, in the absence of the Trustees or Finance Committee, shall have the entire direction and control of the persons employed about the University, and not engaged in the work of instruction; the duties of all such persons shall be assigned, and they shall be appointed or removed by him, subject to the approval of the Finance Committee.

No instructor shall order any books or apparatus, or anything connected with the work of instruction, without the approval of the President. No expense for the care of buildings or grounds, nor for alterations or repairs within and upon the same, shall be made without the approval of the Board of Trustees or Finance Committee, such alterations or repairs in no case to exceed the appropriations made for that purpose. If the Trustees, or Finance Committee, or any persons shall make contracts in behalf of the University without authority, the officer or person making such contract shall become individually responsible therefor.

Each instructor shall give stated lectures to however few. He shall actively and zealously strive to maintain the highest possible standard, shall work in a spirit of hearty sympathy and co-operation, and shall encourage research by precept, and if possible, by example.

The foregoing By-Laws are intended to embody the provisions contained in a vote passed by the corporation on the twenty-third day of May, A. D. 1889, upon the motion of Judge Devens. If at any time hereafter any discrepancy shall be found to exist between the two, said By-Laws shall be so far modified as to conform to the provisions of said vote.

No instructor shall engage in any outside professional or technical pursuit without the approval of the Board, the Finance Committee or the President.

These By-Laws, or any one of them, may be changed, amended or repealed by a vote of three-fourths at least of the Trustees at any meeting of their Board duly called, notified and held for that purpose.

REGULATIONS.

1. All requisitions for apparatus and books must be made through the University office upon printed blanks provided for that purpose, and, except in the case of docents, signed by a member of the staff.

2. So far as possible orders for only the kind and amount of apparatus certain to be used during the year shall be placed; nothing shall be ordered for future years, and apparatus for research shall take precedence over that of teaching and illustration only.

3. A book shall be kept for each department containing a complete list of apparatus and supplies with itemized cost. With the aid of this book a complete inventory of the stock shall be made once a year and whenever else the President shall direct.

4. Requisitions for repairs, furniture, plumbing and work about the buildings must be made in writing and with detail, and must be approved by the Building or Finance Committee, or such person or persons as they may authorize. When once thus passed upon no change involving additional expense can be made in the requisition without the consent of the Finance Committee.

5. No unappropriated rooms, and no part of the University grounds, shall be used for any purpose, and appropriated rooms shall not be used for other purposes than the stated University work for which they were intended, without previous permission from the office.

6. Unless for special reasons, absence of instructors from their stated exercises or from town for two consecutive week days, in term time, should be announced at

the office, and for longer absence permission should be obtained beforehand.

7. The Trustees desire that no instructor, docent or fellow shall enter upon other engagements outside his proper work in the University of a kind or amount likely to lessen his full efficiency for science within the University.

The following additional rules were passed by the Board of Trustees at a meeting held April 4th, 1891, to take effect for the next academic year :

8. Appropriations shall hereafter cover all apparatus and supplies of whatever nature for laboratories, for demonstration or illustration ; all metal and carpenter work connected with the scientific activity of each department, and every form of special service. Appropriations, however, shall not hereafter cover books or journals, which shall be submitted to the Library Committee.

9. The several appropriations made to individual instructors and others shall be the full and fixed limit of the liability of the University, to be on no account transcended, and for every excess over the appropriations, from whatever cause, the instructor making the order shall be personally responsible.

10. No order for any purpose shall be paid by the University, whether on appropriations or for general supplies, that has not passed through the University office.

PUBLICATIONS CONNECTED WITH THE UNIVERSITY.

I.—THE AMERICAN JOURNAL OF PSYCHOLOGY.

This *Journal* was commenced in November, 1887, and is edited by Dr. G. Stanley Hall. Each volume contains four numbers of about 150 pages each. Besides original articles, about half its space is devoted to careful digests of the important literature in its field. Price, \$5.00 per volume; single numbers, \$1.50. J. H. Orpha, publisher, Worcester, Mass.

II. The First Official Announcement was issued May 23rd, 1889.

III. The Addresses and Exercises at the opening of the University on October 2nd, 1889.

IV. Register and Second Official Announcement, May, 1890.

V. First Annual Report of the President to the Board of Trustees, October 4, 1890. This contains the first statement of the plan, aims and methods of the University, and reports upon the original investigation of each department from each member who has made such.

VI. Register and Third Official Announcement, April, 1891.

VII. Second Annual Report of the President to the Board of Trustees, September 29, 1891.

VIII. Register and Fourth Official Announcement, April, 1892.

IX. Third Annual Report of the President to the Board of Trustees, April, 1893. Contains a full report of the work done in each department since the opening of the University, pp. 168.

X. THE PEDAGOGICAL SEMINARY.

This journal was begun in January, 1891, and is edited by the President of the University. It is an international record of educational literature, institutions and progress, and is devoted solely to the highest interest of education in all grades, with digests of important literature of all countries. Each volume contains from 400 to 500 pages. It is the organ of the Educational Department of the University. Price, \$4.00 per volume. Single numbers, \$1.50. J. H. Orpha, publisher, Worcester, Mass.

SUMMER SCHOOL OF PEDAGOGY AND PSYCHOLOGY.

A summer school in pedagogy and psychology was held at the University during the last two weeks in July. It was conducted by Drs. Hall, Sanford and Burnham. Three sessions a day were held and the resources of the library and laboratories in this department were placed at the disposal of the members. The exercises consisted of lectures, demonstrations, seminars, etc., and a fee of \$20 for the two weeks was charged. The topics treated were, for the most part, selected beforehand by intending members of the school from an extensive list comprising the regular courses of the University in psychology and pedagogy.

MEMBERS OF THE SUMMER SCHOOL.

CHARLES F. ADAMS, Instructor in Massachusetts State Normal School, Worcester, Mass.

E. G. ADAMS, A. B., Supt. of Schools, Rochester, Minn.

HERBERT E. AUSTIN, Teacher of Science and Mathematics, Dalzell's School, Worcester, Mass.

THOMAS P. BAILEY, JR., Ph. D., Adj., Prof. of Biology, South Carolina College, Columbia, S. C.

JOSEPH BALDWIN, Ph. D., Prof., School of Pedagogy, University of Texas, Austin, Tex. "The Art of School Manage-

ment," "Elementary Psychology," "Psychology Applied to the Art of Teaching."

EARL BARNES, M. S., Prof. of Education, Leland Stanford, Jr., University, Palo Alto, Cal.

WILLIAM P. BEECHING, Assistant in Science, Cook County Normal School, Englewood, Chicago, Ill.

MISS ELLEN BLAKE, 50 West street, Worcester, Mass.

MISS LOUISA BLAKE, 50 West street, Worcester, Mass.

EDWARD F. BUCHNER, A. M., Lecturer on Pedagogy, Yale University, New Haven, Conn.

MISS S. L. BURLINGAME, M. A., Preceptress, in Central Baptist College, Conway, Arkansas.

MISS ANNA M. BURNHAM, Vice-Prin. Harrison School, Portland, Oregon.

MISS ISOBEL CAMP, Pd. M., Teacher Brooklyn Public School No. 5, 62 Willow street, Brooklyn.

MISS E. E. CARLISLE, Director of Teachers' Training School, Norwich, Conn.

ELLIS COMPTON, Ph. D., Prof. Psychology and Philosophy, University of Wooster, Ohio; Editor *Post Graduate and Wooster Quarterly*.

EMILY I. CONANT, Ph. D., Teacher of Psychology, Lloyd Normal College, New York City, 42 West street, New York.

CHARLES HENRY DOUGLAS, A. M., Head Master Keene High School and City Supt., Keene, N. H.

MISS HARRIET F. EASTABROOKS, Prin. Primary Training Department, State Normal School, Mankato, Minn.

F. H. EATON, A. M., late Teacher of Mathematics in the Nova Scotia Normal School, 40 Concord avenue, Cambridge, Mass. "Treatise on Trigonometry and Its Application."

GEORGE L. FARNHAM, A. M., Prin. State Normal Schools, Peru, Neb. "The Sentence Method."

MISS GERTRUDE FLYNN, Training and Method Teacher, State Normal School, Norwich, Conn.

MISS LILA N. FROST, Prin. Bromfield School, Harvard, Mass.

MISS ELLEN M. HASKELL, State Normal School, Worcester, Mass.

MISS EMILY A. HAYWARD, M. A., High School Teacher of English and Latin, Denver, Colorado.

WALTER L. HERVEY, A. M., Pres. College for the Training of Teachers, New York City.

HARRIET E. HUNT, Ph. D., Prin. of School and Director of Nature Studies, Public Schools, Brookline, Mass.

JOSEPH JACKSON, Prin. Woodland Street School, Worcester, Mass.

JAMES JENKINS, A. M., Prin. English High School, Worcester, Mass.

MISS REBECCA JONES, Teacher of Methods in State Normal School, Worcester, Mass.

E. ORAM LYTE, Ph. D., Prin. Pennsylvania State Normal School, Millersville, Pa. Grammar and Composition, Practical Book-keeping, School Song Book, School Bell, etc.

E. MACKEY, A. B., Supt. of Schools, Butler, Pa.

MISS SARAH MARBLE, Teacher in Rhode Island State Normal School, Providence, R. I., Woonsocket, R. I.

C. A. McMURRY, Ph. D., Supt. of Practical Work, State Normal School, Normal, Ill. "General Method," "Pioneer History Stories," "A Geography Plan."

F. M. McMURRY, Ph. D., Student of Education, Paris, France.

MISS JENNIE B. MERRILL, Ph. D., Instructor of Pedagogy, Normal College, New York City.

THEODORE B. NOSS, Ph. D., Prin. State Normal School, California, Pa. "Outlines of Pedagogy and Psychology."

F. W. OSBORN, A. M., "Famous American Political Documents;" Prof. of Mental, Moral and Political Science, Adelphi Academy, Brooklyn.

ALVIN F. PEASE, A. M., Supt. of Schools, Northampton, Mass.

MISS ALICE EDWARDS PRATT, Ph. B., Asst. Prin. Santa Rosa Seminary, Santa Rosa, Cal.

MISS LUCY A. PRATT, A. B., 778 Main street, Worcester, Mass.

E. B. PRETTYMAN, A. M., Prin. of Maryland State Normal School and *ex-officio* State Supt. of Public Instruction, Baltimore, Md., 1,200 Lafayette avenue.

JOHN T. PRINCE, Ph. D., Agent Massachusetts Board of Education, Boston, Mass. "Courses of Studies and Methods of Teaching," "Organization and Instruction in the Schools of Germany."

MISS REBECCA S. RICE, A. M., Prin. of Girls' Collegiate School, Chicago, Ill., 481 Dearborn avenue.

E. HARLOW RUSSELL, Prin. State Normal School, Worcester, Mass.

LEE RUSSELL, B. S., Teacher of Manual Training, Halifax, Nova Scotia, 11 Inglis street, Halifax.

MISS E. C. SABIN, Pres. Downer College, Fox Lake, Wis., late Supt. of Portland, Ore., City Schools.

HOWARD SANDISON, M. A., Prof. of Psychology and Methods, Indiana State Normal School, Terre Haute, Ind. "The Theory of the School," "Educational Psychology."

NATHAN C. SHAEFFER, Ph. D., Prin. Keystone State Normal School, Kutztown, Pa.

LEVI SEELEY, Ph. D., Prin. Ferry Hall Seminary and Prof. of Education, Lake Forest University, Lake Forest, Ill. "The Grube Method," "The Grube Idea."

EDWARD R. SHAW, Ph. D., Prof. of the Theory and Art of Teaching, University of the City of New York, New York City.

W. J. SLATTERY, A. B., Teacher of Psychology and Methods, City Training School, Paterson, N. J.

MISS MARGARET K. SMITH, Teacher of Psychology and Method, Oswego Normal School, Oswego, N. Y.; joint author of "Development Lessons," translator of Seidel's Industrial Instruction, Herbert's Manual of Psychology.

JOHN D. STAY, A. M., Supt. Public Schools, Yankton, South Dakota.

MISS ROSE C. SWART, Inspector of Practice Teaching, State Normal School, Oshkosh, Wis.

F. TRACY, B. A., Fellow in Toronto University, Toronto, Canada.

MISS NATHALIE L. VIDAUD, Teacher in Yonkers High School, Yonkers, N. Y.

W. J. WAGGENER, A. M., Prof. Natural Philosophy, University of Colorado, Col.

MISS ANNA M. WAITE, Salisbury Street School, Worcester, Mass.

MISS HARRIET G. WAITE, Prin. Freeland Street School, Worcester, Mass.

WALTER P. WHITE, A. B., Teacher of Sciences, Oshkosh High School, Oshkosh, Wis.

HENRY WHITEMORE, Supt. of Schools, Waltham, Mass.

JOSEPH H. WIGHT, B. S., Medfield, Mass.

MISS LILLIE A. WILLIAMS, Teacher of History and Psychology, New Jersey State Normal School, Trenton, N. J.

MRS. KATE E. WILSON, Teacher of Natural Science, Howard Seminary, West Bridgewater, Mass.

Besides those attending the full course, 65 others attended lectures and exercises in special subjects.





Clark University,
in the City of Worcester,
Massachusetts.

Register and
Sixth Official
Announcement.

1894.

TRUSTEES OF THE UNIVERSITY.

President,	-	-	-	-	JONAS G. CLARK.
Vice-Presidents,	-	-	-	-	{ GEORGE F. HOAR.
					{ WILLIAM W. RICE
Treasurer,	-	-	-	-	THOMAS H. GAGE.
Secretary,	-	-	-	-	FRANK P. GOULDING.

FULL BOARD OF TRUSTEES.

Jonas G. Clark.	
Stephen Salisbury.	John D. Washburn.
Frank P. Goulding.	George F. Hoar.
George Swan.	William W. Rice.
Edward Cowles.	Thomas H. Gage.

COMMITTEES.

FINANCE.

Jonas G. Clark.
 Stephen Salisbury.
 John D. Washburn.
 Thomas H. Gage.

BUILDINGS.

Jonas G. Clark.
 Stephen Salisbury.

BY LAWS.

Jonas G. Clark.
 William W. Rice.
 John D. Washburn.
 Stephen Salisbury.
 George Swan.

James P. Hamilton, - - - Cashier.

CLARK UNIVERSITY,

WORCESTER, MASS.

REGISTER

AND

Sixth Official Announcement.

WORCESTER, MASS.:

PUBLISHED FOR THE UNIVERSITY.

May, 1894.

CALENDAR : 1894-95.

1894.

JUNE 21. Thursday. Present academic year ends.

OCT. 2. Tuesday. Sixth academic year begins.

DEC. 24. Monday.	}	Christmas Recess.
1895.		

JAN. 2. Wednesday. }

Date of the Spring Recess and close of next academic year to be determined later.

MEMBERS.

G. STANLEY HALL, PH. D., LL. D., President of the University. 94 Woodland St.

A. B., Williams College, 1867, and A. M., 1870; Ph. D., Harvard University, 1878; Lecturer in Harvard and Williams Colleges, 1880-81; Professor of Psychology, Johns Hopkins University, 1881-88; LL. D., University of Michigan, 1888, and Williams College, 1889; Resident Fellow of the American Academy of Arts and Sciences.

WILLIAM E. STORY, PH. D., Professor of Mathematics. 17 Hammond St.

A. B., Harvard University, 1871; Ph. D., Leipzig, 1875; Parker Fellow (Harvard), 1874-75; Tutor of Mathematics, Harvard University, 1875-76; Associate, Assistant Professor, and Associate Professor of Mathematics, Johns Hopkins University, 1876-89; Member of the London Mathematical Society; Resident Fellow of the American Academy of Arts and Sciences.

CLIFTON F. HODGE, PH. D., Assistant Professor of Physiology and Neurology. 11 Tirrell St.

A. B., Ripon College, 1882; Fellow in Biology, Johns Hopkins University, 1888-89; Ph. D., Johns Hopkins University, 1889; Fellow in Psychology and Assistant in Neurology, Clark University, 1889-91; Instructor in Biology, University of Wisconsin, 1891-92.

EDMUND C. SANFORD, PH. D., Assistant Professor of Psychology. 21 Oread St.

A. B., University of California, 1883; Fellow of Johns Hopkins University, 1887; Ph. D., Johns Hopkins University, 1889; Instructor in Psychology, Johns Hopkins University, 1888.

HENRY TABER, PH. D., Assistant Professor of Mathematics. 9 Oread Place.

Ph. B., Yale (Sheffield Scientific School), 1882; Ph. D., Johns Hopkins University, 1888, and Assistant in Mathematics, Johns Hopkins University, 1888-89; Member of the London Mathematical Society; Resident Fellow of the American Academy of Arts and Sciences.

ARTHUR G. WEBSTER, PH. D., Assistant Professor of Physics. 936 Main St.

A. B., Harvard, 1885; Instructor in Mathematics, Harvard, 1885-86; Parker Fellow, 1886-89; Student, Universities of Berlin, Paris, Stockholm, 1886-90; Ph. D., Berlin, 1890.

WILLIAM H. BURNHAM, PH. D., Instructor in Pedagogy.
100 Chatham St.

A. B., with honors in Philosophy, Harvard University, 1882; Instructor in Wittenberg College, 1882-83; Instructor in the State Normal School, Potsdam, N. Y., 1883-85; Fellow, Johns Hopkins University, 1885-86; Ph. D., 1888, and Instructor in Psychology, 1888-89.

SAMUEL P. MULLIKEN, PH. D., Instructor in Chemistry.
19 Richards St.

S. B., Mass. Institute of Technology, 1887; Assistant in Chemistry, University of Cincinnati, 1887-88; Ph. D., University of Leipzig, 1890; Fellow in Chemistry, Clark University, 1890-91; Associate in Chemistry, Bryn-Mawr College, Bryn-Mawr, Pa., 1891-92; Instructor in Clark University, 1892.

ALEXANDER F. CHAMBERLAIN, PH. D., Lecturer in Anthropology. 20 Grand St.

B. A., University of Toronto, Canada, 1886; M. A., University of Toronto, 1889; Fellow (tutorial and post-graduate work) in Modern Languages in University College, Toronto, 1887-90; Examiner in German in University College, and the University of Toronto, 1888-92; Examiner in Modern Languages in the University of Trinity College, Toronto, 1890-91; Examiner in French and German, Department of Education, Ontario, 1888-89; Fellow in Anthropology, Clark University, 1890-92, and Lecturer in Anthropology, 1892; Anthropological Researches in British Columbia under the auspices of the British Association for the Advancement of Science, summer of 1891; Fellow of the American Association for the Advancement of Science.

JOSEPH DE PEROTT, Docent in Mathematics,
15 Florence St.

Universities of Paris and Berlin, 1877-80.

H. AUSTIN AIKINS, PH. D., Toronto, Ont., Honorary Fellow in Psychology. 1018 Main St.

B. A., University of Toronto, 1887; Instructor in University of Southern California, 1888; Yale University, 1888-91; and Lecturer on History of Philosophy in Yale, 1890-91; Ph. D., Yale, 1891; Professor of Logic and Philosophy in Trinity College, N. C., 1891-92; Fellow in Psychology, Clark University, 1892-94.

PERCY NORTON EVANS, PH. D., Montreal, Canada, Honorary Fellow in Chemistry. 84 Woodland St.

B. A. Sc., McGill University, Montreal, 1890; Assistant in Chemistry, 1890-91; University of Leipzig (Exhibition of 1851, Science Scholar), 1891-93; Ph. D., Leipzig, 1893.

RICHARD J. HOLLAND, PH. D., Cobourg, Ontario, Canada, Honorary Fellow in Physics. 84 Woodland St.

B. A., Victoria College (Toronto), 1887; Certificate Specialist in Science, Teachers' Training Institute, Kingston, 1888; Science Master, Morrisburg, Coll., Inst., 1888-90; Student, Leipzig University, 1890-93; Ph. D., Leipzig, 1893.

ALBERT E. SEGSWORTH, B. A., Toronto, Canada, Honorary Fellow in Psychology. 6 Charlotte St.

B. A., University of Toronto, 1890; Student at University of Leipzig, 1890-91; at University of Toronto, 1891-92; Student at University of Leipzig, 1892-93.

FRANKLIN W. BARROWS, M. D., Buffalo, N. Y., Fellow in Physiology. 25 Bowdoin St.

A. B., Amherst, 1885; Instructor in Sciences, Worcester Academy. 1885-88; A. M., in course, Amherst, 1888; Instructor in Natural Sciences, High School, Buffalo, 1888-Jan., 1894; M. D., University of Buffalo, 1893.

JOHN A. BERGSTRÖM, A. B., Middletown, Conn., Fellow and Assistant in Psychology. 5 Gates St.

A. B., Wesleyan University, Middletown, Conn., 1890; Fellow in Psychology, Clark University, 1891-94.

L. WAYLAND DOWLING, Adrian, Mich., Fellow in Mathematics. 2 Charlotte St.

Adrian College, 1889-90; Principal of Schools, Clayton, Mich., 1891-92; Scholar in Mathematics, Clark University, 1892-93.

FLETCHER B. DRESSLAR, A. M., Banta, Ind., Fellow in Psychology. 17 Freeland St.

A. B., University of Indiana, 1889; A. M., 1892; Instructor in Vincennes University, 1888; Principal of High School, Princeton, Ind., 1889-90; Superintendent, 1890-91; Instructor in Psychology, University of Indiana, 1892; Fellow in Psychology, Clark University, 1892-93.

JOHN H. GRAY, Jr., B. S., Berkeley, Cal., Fellow in Chemistry. 10 Buffum St.

B. S., University of California; Assistant to State Analyst (of California), 1887-90; Assistant in Chemistry, University of California, 1889-90, and Instructor in Chemistry, 1890-92; Fellow in Chemistry, Clark University, 1892-93.

JOHN E. HILL, Ph. B., Mystic, Conn., Fellow in Mathematics. 44 Richards St.

Ph. B., Yale, 1885; Resident Engineer, C. M. & St. P. R. R., 1885-88; Professor of Mathematics, Louisville Military Academy, Louisville, Ky., 1888-89; Superintendent of Schools, Pleasantville and Pleasantville Station, N. Y., 1889-90; Professor of Mathematics and Civil Engineering, Highland Park College, Des Moines, Ia., 1890-92; Fellow in Mathematics, Clark University, 1892-93.

HERBERT G. KEPPEL, A. B., Zeeland, Mich., Fellow in Mathematics. 2 Charlotte St.

A. B., Hope College, Holland, Mich., 1889; Teacher of Mathematics, Northwestern Classical Academy, Orange City, Ia., 1891-92; Scholar in Mathematics, Clark University, 1892-93.

CLARENCE ARTHUR SAUNDERS, M. A., Florenceville,
N. B., Canada, Fellow in Physics. 2 Charlotte St.

B. A., King's College, Windsor, Nova Scotia, 1885; M. A., Nova Scotia, 1888; Johns Hopkins University, 1889-92; Assistant to Prof. Langley, Smithsonian Institution, 1891-92; Fellow in Physics, Clark University, 1892-93.

OSCAR CHRISMAN, A. M., Gonzales, Texas, Fellow in Ped-
agogy. 19 Shirley St.

Teacher in Public Schools of Indiana, 1876-1883; Principal, 1883-85; A. B., Indiana University, 1888, and A. M., 1893; Principal, Longfellow School, Houston, Texas, 1888-89; Superintendent of Public Schools, Gonzales, Texas, 1889-92; Fellow in Pedagogy, Clark University, 1892-93.

FRANK DREW, A. M., Fellow in Psychology.
70 Florence St.

Superintendent of Schools, Genoa, Ill., 1887-89; A. B., University of Indiana, 1890, and A. M., 1891; Student in Psychology, Clark University, 1892-93.

JOHN A. HANCOCK, M. A., Green Bay, Wis., Fellow in
Pedagogy. 8 Gates St.

B. S., Baker University, 1877; M. L., University of Wisconsin, 1890; M. A., Stanford University, 1893; School Teacher, 1877-81; Supervising Principal of Schools, Farmland, Ind., 1881-85, and at Elroy, Wis., 1885-89; Student in Pedagogy, University of Wisconsin, 1889-90; City Superintendent, Green Bay, Wis., 1890-92; Student in Pedagogy, Leland Stanford, Jr., University, 1892-93.

JAMES H. LEUBA, Ph. B., Fellow in Psychology. 8 King St.

B. S., Neuchâtel, Switzerland, 1886; Ph. B., Ursinus College, Pa., 1888; Teacher of the French Language, St. Mark's School, Southboro, Mass., 1891-92; Scholar in Psychology, Clark University, 1892-93.

THOMAS F. NICHOLS, A. B., Phippsburgh, Me., Fellow in
Mathematics. 4 Lowell St.

A. B., Bowdoin College, 1892; Scholar in Mathematics, Clark University, 1892-93.

JAMES R. SLONAKER, B. S., Farmland, Ind., Fellow in
Biology. 8 Gates St.

Graduate Indiana State Normal School, 1889; Supervising Principal of Schools, Elroy, Wis., 1889-91; B. S., University of Wisconsin, 1893.

F. E. STINSON, Fellow in Mathematics. 84 Woodland St.

Iowa Agricultural College, 1884-86; Principal of the Poplar Grove (Ark.) Institute, 1889-90; Teacher of Physics and Mathematics, Paris (Ark.) Academy, 1890-92; Scholar in Mathematics, Clark University, 1892-93.

S. N. TAYLOR, Ph. B., Farmingdale, N. Y., Fellow in
Physics. 67 Florence St.

Ph. B., Wesleyan University, Middletown, Conn., 1887; in Charge of Experimental Laboratory, Thomson-Houston Electric Works, Lynn, Mass., 1887-91; Professor of Natural Sciences, Maine Wesleyan Seminary and Female College, 1891-93.

JULIUS B. WEEMS, Solomons, Md., Fellow in Chemistry.
70 Florence St.

Maryland Agricultural College, 1888; Instructor in Chemistry and Mathematics, in same, 1888-89; Johns Hopkins University, 1889-91; Chemist at Phosphate Mines, Fla., 1891-92; Fellow in Chemistry, Clark University, 1892.

R. AKIYAMA, Tokio, Japan, Scholar in Chemistry.
70 Florence St.

School of Science, Tokio, Japan, 1888-90; College of Pharmacy, San Francisco, Cal., 1890-91; University of California, 1891-93.

WARREN G. BULLARD, A. B., Geneva, N. Y., Scholar in Mathematics. 4 Lowell St.

A. B. (with honors in Mathematics), Brown University, 1892; Instructor in Mathematics in Elmira Free Academy, Elmira, N. Y., 1892-93.

GEO. ELLSWORTH JOHNSON, A. M., Springfield, Vt., Scholar in Pedagogy. 23 Benefit St.

A. B., Dartmouth, 1887; A. M., 1891; Principal, Colebrook (N. H.) Academy, 1887-88; Principal of Schools, Springfield, Vt., 1888-92; Student, Hartford Theological Seminary, 1892-93.

STANLEY H. ROOD, S. B., Worcester, Mass., Scholar in Physics. 30 John St.

S. B., Worcester Polytechnic Institute (in Mechanical Engineering), 1890; (in Electrical Engineering), 1891; Instructor in Physics, Worcester Polytechnic Institute, 1890-93.

ALBERT H. YODER, A. B., Madison, South Dakota, Scholar in Pedagogy. 21 Queen Street.

Teacher in Dakota Public Schools, 1882-87; Graduate State Normal School, 1888; Superintendent of Schools, Madison, South Dakota, 1888-91; A. B., University of Indiana, 1893; Institute Instructor, South Dakota, summers of 1892-93; Editor, Professional Department, of *South Dakota Educator*.

WILLIAM A. HOYT, A. M., Winthrop, Me., Student in Pedagogy. 41 Oread St.

B. A., Bates College, 1880, and A. M., 1884; Principal of High School, Rockport, Me., 1881-82; Principal of Greely Institute, Cumberland, Me., 1882-83; Cornwall Heights School, Cornwall, N. Y., 1883-86; Principal of High School, Medway, Mass., 1886-1888; North Brookfield, Mass., 1888-1892; Augusta, Me., 1892-93.

A. MARDEROS IGNATIOS, Smyrna, Turkey, Student in Psychology. 225 Main St.

Graduate Harpoot Seminary, 1872; Teacher at Agin, 1872-80; Professor of Languages and Turkish Law, Uphradas and Central Colleges, 1880-84; Pastor of Evangelical Churches at Menesonan and Smyrna, Turkey, 1884-93.

JAMES JENKINS, A. M., Worcester, Mass., Student in Pedagogy. 59 Providence St.

A. B., Colby University, 1879, and A. M., 1891; Principal of High School, Maynard, Mass., 1878-79, and Ayer, Mass., 1880-82; Instructor in Mathematics, Worcester Academy, 1883-85; Principal Dix St. Grammar School, Worcester, 1885-92; Principal English High School, Worcester, 1892; Member of the American Economic Association.

ALBERT B. KIMBALL, S. B., Worcester, Mass., Student in Physics. 28 Boynton St.

S. B. (Mechanical Engineering), Worcester Polytechnic Institute, 1889, and S. B. (Electrical Engineering), 1890; Teacher of Physics and Mathematics, La Grange (Ill.) High School, 1890-91; Instructor in Manual Training, Brookline, Mass., 1891-92; Teacher of Physics, English High School, Worcester, Mass., since 1892.

JAMES S. LEMON, A. M., Gardner, Mass., Student in Psychology.

A. B., Wesleyan University, 1864; A. M., 1867; Principal of Brownville High School, Professor of Physics, Marion Institute; Principal of Almond Collegiate Institute, Principal of Macedon Academy, all in New York, 1867-80; since 1880, Episcopal Rector and Editor of the Religious Department of the *National Tribune*, Washington, D. C.; Lecturer in Psycho-Physics, Columbian University, Washington, D. C., 1892.

ADMINISTRATION.

The Trustees are the ultimate source of authority in all matters pertaining to the University. They act collectively, through the three committees named below, and also through the President of the University.

BOARD OF TRUSTEES.

JONAS G. CLARK,

STEPHEN SALISBURY,

GEORGE F. HOAR,

WILLIAM W. RICE,

EDWARD COWLES,

JOHN D. WASHBURN,

FRANK P. GOULDING,

GEORGE SWAN,

THOMAS H. GAGE.

OFFICERS.

President, - - JONAS G. CLARK.

Vice-Presidents, - { GEORGE F. HOAR,
WILLIAM W. RICE.

Treasurer, - - THOMAS H. GAGE.

Secretary, - - FRANK P. GOULDING.

COMMITTEES.

Finance.

JONAS G. CLARK,

STEPHEN SALISBURY.

JOHN D. WASHBURN,

THOMAS H. GAGE.

Buildings.

JONAS G. CLARK.

JOHN D. WASHBURN.

By-Laws.

JONAS G. CLARK,

WILLIAM W. RICE,

STEPHEN SALISBURY,

JOHN D. WASHBURN,

GEORGE SWAN.

PRESIDENT.

The duties of this office were defined by the Trustees, May 23, 1889, as follows :

The President of the University shall consult frequently with the Trustees on all matters which concern the welfare of the University, and attend the meetings of the Board. He shall confer with each instructor concerning the development of his department, determine the duties and authority of each, and preside at the meetings of the Faculty. He shall be the authorized medium of communication between the Board of Trustees and the officers of instruction, individually and collectively, in all matters involving the administration of the University. The enactments of the Board concerning instructors and their work, and all requests, complaints and proposals from the Faculty to the Trustees, shall be made known through him. He shall exercise or provide such superintendence over buildings, apparatus, books and other property as will secure their protection and appropriate use. Expenditures must not be ordered by any instructor of the University without his previous consent, or the express authority of the Board.

These duties were more fully defined by By-Laws enacted by the corporation, September 26, 1889.

FACULTY.

By action of the Trustees, the Faculty Staff has been organized as follows :

I. UNIVERSITY SENATE.

Whose duty it is to elect fellows and to take action upon general requirements for the Doctor's degree and other promotions, and to act and advise upon matters officially submitted to them.

II. GENERAL FACULTY.

Whose duty it is to consider all matters not otherwise provided for, and in which all departments of the University are alike interested.

III. THE LIBRARY COMMITTEE.

To be appointed by the President or Trustees, the duty of which shall be to advise concerning the arrangement, cataloguing and use of books and other matters pertaining to the library not reserved to the Trustees or otherwise provided for.

GENERAL STATEMENTS.

The University now consists of a group of five closely related departments, in which all its work and that of instructors, fellows and scholars is grouped. These departments are as follows:

- I. MATHEMATICS.
- II. PHYSICS.
- III. CHEMISTRY.
- IV. BIOLOGY.
- V. PSYCHOLOGY.

In addition to these *Education* is now a sub-department.

ADMISSION.

Only graduate students are admitted, or those of equivalent attainments, unless in rare and special cases. At present no entrance examinations are required, but, by testimonials, diplomas, personal interviews or written specimens of work, the authorities must be satisfied that the applicant has scholarship enough to work to advantage, and zeal and ability enough to devote himself to his chosen

field. The methods of the University are too costly, and its energy and funds too precious to be spent upon men who are not well trained, promising, and in earnest.

It is highly desirable, and will probably before long be required, that candidates entering any of the five departments shall have, besides a knowledge of the other subjects commonly taught in colleges, a reading knowledge of French and German.

For the select students who are received, it is the purpose of the University to open all its privileges, and to supply every incentive possible in the way of books, facilities, and above all, direct personal stimulus and instruction. The chief as well as the best work of this University is individual, and involves daily suggestion, encouragement and direction.

CLASSES OF APPOINTEES.

No clearly marked line exists between students and instructors. Fellows and scholars who have attained some degree of mastery in a special line of work give brief special courses, which are often attended by professors. This is a stimulus to the student, and both tests and exhibits his power in teaching. This and the custom of instructors of

attending each other's lectures, add interest and efficiency to the work of the University.

I. DOCENTS.

The highest annual appointment is that of Docent. These positions are primarily honors, and are reserved for a few men whose work has already marked a distinct advance beyond the Doctorate and who wish to engage in research. They are not assistants, and their relations are directly with the President of the University.

Docents may be provided with individual rooms, and special apparatus may be purchased for their work if desired and approved. While they will be expected to deliver a limited number of lectures on some special chapter of their department, their time will be mainly reserved for study and research in a way best adapted to qualify them still more fully for academic advancement.

These positions are now official appointments. Appointees, or others found worthy, however, may be formally invested with the *licentia docendi*, the terms of which can now be furnished on application and which requires a memoir or essay representing original work in their own department, but no examination. This highest formal academic honor will be strictly reserved for those of marked

scientific attainment and teaching ability, and so far as this diploma can have the significance of a title or degree, it will be regarded by the University as a brevet collegiate professorship.

It is believed that by the existence of such a select body of men of guaranteed scientific training, ability and approved power to teach, the difficulties under which college trustees sometimes succumb in selecting suitable men for their professors may be diminished, and that otherwise this new grade will aid in raising standards of academic scholarship in colleges and in encouraging scientific research here. Good men of this class may be paid a salary.

II. CANDIDATES FOR THE DEGREE OF DOCTOR OF PHILOSOPHY.

In most cases it is probable that three, or at least two, years of graduate work will be necessary for this degree. Examinations for it, however, may be taken at any time when, in the judgment of the University authorities, the candidate is prepared. A pre-arranged period of serious work at the University itself is indispensable.

For this degree the first requirement is a thesis upon an approved subject, to which it must be an

original contribution of value. To this, capital importance is attached. It must be reported on in writing by the chief instructor, printed at the expense of the candidate, and at least one hundred copies given to the University. In case, however, of theses of very unusual length, or containing very expensive plates, the academic Senate shall have power, at the request of the candidate, to reduce this number of presentation copies to 50. Each of these copies shall bear upon it in print the statement of the chief instructor, that it is a thesis for the Doctor's degree in his department at Clark University.

Such formal or informal tests as the academic Senate shall determine shall mark the acceptance of each student or fellow as a candidate for this degree.

One object of this preliminary test shall be to insure a good reading knowledge of French and German. Such formal candidature shall precede by not less than three months and not more than one year the examination itself, and the nature and result of this test shall be made matter of record.

The fee for the Doctor's degree is \$25, and in every case it must be paid and the presentation

copies of the thesis must be in the hands of the Librarian before the diploma is given. In exceptional cases, however, and by special action of the Senate, the ceremony of promotion may precede the presentation of the printed copies of the thesis. The latter, however, must always precede the actual presentation of the diploma.

An oral but not a written examination is required upon at least one minor subject in addition to the major, before an examination jury, composed of at least four members, including the head of the department and the President of the University, who is authorized to invite any person from within or without the University to be present and to ask questions. The jury shall report the results of the examination to the Senate, who, if they are also satisfied, may recommend the candidate for the degree.

For the bestowal of this degree, the approbation of the Board of Trustees must in each case be obtained. They desire that the standard requirements for it be kept the highest practicable, that it be reserved for men of superior ability and attainment only, and that its value here be never suffered to depreciate.

It is to the needs of these students that the lectures, seminars, laboratories, collections of books,

apparatus, etc., are specially shaped, and no pains will be spared to afford them every needed stimulus and opportunity. It is for them that the Fellowships and Scholarships are primarily intended, although any of these honors may be awarded to others.

III. SPECIAL STUDENTS NOT CANDIDATES FOR A DEGREE.

Any one desiring to undertake a special and approved line of research, and whose attainments are such as to satisfy the requirements of the University, may also be received. This class includes those who may desire to devote themselves exclusively to one or more of the special branches — mathematics, physics, chemistry, biology, psychology, or education, — but who do not care to matriculate or become candidates for a degree.

These students, provided they satisfy the heads of the departments of their training and competency in one subject, in which they must be advanced (although they may be less so, or even beginners, in other subjects), may be allowed entire freedom in their choice and combination of studies, and as special students may enjoy all the privileges of the University.

These students may, with the approval of the President, be received for less than an entire year.

IV. PRELIMINARY CANDIDATES.

Non-university students of less special or less advanced standing than the above three classes, who are nearly, if not quite, qualified to become candidates for the degree of Doctor of Philosophy, may also be received.

Students of this class must for the present have completed the work of the first three years of a regular under-graduate course in a college of good standing, or the equivalent thereof. They must satisfy the authorities of the University of their attainments, and that they contemplate advancing to a degree higher than that of A. B. The privileges and status of these students will be more fully defined later. They may in exceptional cases be elected to Scholarships.

THE CLARK FELLOWSHIPS AND SCHOLARSHIPS.

10 Fellowships of \$600 per year.

10 Fellowships of \$400 per year.

10 Scholarships of \$200 per year.

10 Scholarships of \$100 per year.

In general these appointments may perhaps represent the successive stages of approximation to

the Doctor's degree, the highest Fellowships being commonly given to men within a year of that degree. Those who have already taken the Doctor's degree or those not intending to do so, may be appointed to Fellowships and Scholarships. *All Fellows and Scholars pay full tuition of \$200.*

The founder of the University and his wife unite with the Trustees and President in inviting sympathy and practical coöperation in the multiplication of such aids, large or small, temporary or permanent, here at the outset.

A CITIZEN'S FUND.

In addition to this a citizen of Worcester has given a fund of \$5,000, the income of which is to be used for the aid of "some one or more worthy native born citizens of the city of Worcester who may desire to avail themselves of the advantages of the institution."

THE FIELD FUND.

Mrs. Eliza W. Field has also given \$500, to be called the "John White Field Fund," the income of which is "to provide for the minor needs of a Scholar or Fellow."

PURPOSE AND CONDITIONS OF FELLOWSHIPS AND SCHOLARSHIPS.

Fellowships at Clark University are intended for young men of promise who desire to pursue post-graduate studies in order to fit themselves for intellectual careers. It is desirable, but not required, that candidates for these positions should intend to proceed to the degree of Doctor of Philosophy or to equivalent attainments. In general those intending to devote themselves to some special branch of learning are preferred to those directly fitting themselves for one of the three learned professions, although the latter are not excluded.

Applications should state the candidate's course of study and be accompanied by testimonials or diplomas, should indicate a decided preference for some special department, and if possible be accompanied by some specimen of his work for the aid of the Board of Selection. Applications will be considered in June and in October, and should be in the hands of the President on or before the first of these months. In special cases vacancies may be filled by appointments at any time during the year. The names of unsuccessful candidates will not be made public.

Fellows must reside in Worcester during the entire academic year and devote themselves to special studies under the direction of their instructors, and give such evidence of progress or proficiency before the end of the year as the authorities shall require. It is generally expected that they will undertake some work of research during the year. They must coöperate in promoting harmony, order and all the ends of the University, must not teach elsewhere and may be reappointed at the end of the year. Because intended primarily as honors, both Fellowships and Scholarships are awarded without reference to pecuniary needs, so that those able and desiring to do so may relinquish the emolument and retain the title of "Scholar" or "Fellow."

Both Scholarships and Fellowships are open only to students in one or more of the five departments announced.

METHODS.

Besides field work, excursions to institutions public and private, coaching and cram-classes, clubs, examinations, conferences and other modes by which knowledge now seems best imparted and retained, the following educational methods are prominent:

LECTURES. The Trustees desire that each instructor of however few students, should prepare and deliver regular lecture courses, with diagrams, illustrative apparatus and references to standard text-books, and the best current literature upon each topic. Advanced students are also encouraged to supplement the work of the professors by giving occasional special lectures and courses. Public lectures will from time to time be given.

SEMINARIES. These are stated meetings for joint, systematic work, under the personal direction of the professor, in some special part of his subject. Here the results of individual reading are reported for the benefit of all; views are freely criticised; new inquiries, methods, comparisons, standpoints, etc., suggested. From the mutual stimulus thus given, many important works have proceeded, and the efficiency of universities has been greatly increased.

LABORATORY WORK. For beginners this was from the first the best of all forms of apprenticeship, bringing student and professor to a closer and mutually stimulating relation. Here the manipulation of apparatus is learned, processes are criticised, results obtained by other investigators are tested, methods discussed and perfected, with a view to developing that independence in re-

search which is the consummation of scientific culture.

NOTICES.

The charge for tuition, giving all the privileges of the University, but not covering the laboratory fees, is \$200 per annum.

Board and lodging can be obtained near the University at very moderate rates.

Intending students will, so far as possible, be informed upon any of these or other points, in advance of official announcement, upon addressing the Clerk of the University, Mr. Louis N. Wilson, Worcester, Mass.

DEPARTMENTS.

The statements of the instructors concerning the courses to be given during the academic year 1894-95, which follow, are supplemented by a fuller account of the past and present work of each department contained in the third Report of the President and Departments, April, 1893.

Further announcements may be made later.

I.

MATHEMATICS.

PROGRAMME FOR 1894-95.

The introductory courses are given in alternate annual groups, as follows :

GROUP A (to be given in 1894-95):

ANALYTIC GEOMETRY OF CONIC SECTIONS, QUADRIC SURFACES, AND HIGHER PLANE CURVES; 3 hours a week, through the year.

THEORY OF FUNCTIONS OF REAL AND IMAGINARY VARIABLES AND DEFINITE INTEGRALS; 3 hours a week, through the year.

THEORY OF NUMBERS; 2 hours a week, first half-year.

MODERN SYNTHETIC GEOMETRY; 2 hours a week, second half-year.

GROUP B (not given in 1894-95):

ANALYTIC GEOMETRY OF CONIC SECTIONS, QUADRIC SURFACES, AND HIGHER PLANE CURVES; 3 hours a week, through the year.

ELLIPTIC FUNCTIONS, DIFFERENTIAL EQUATIONS, AND CALCULUS OF VARIATIONS; 3 hours a week, through the year.

ALGEBRAIC SUBSTITUTIONS AND THEIR APPLICATIONS TO THE THEORY OF EQUATIONS; 2 hours a week, first half-year.

ANALYTIC GEOMETRY OF HIGHER SURFACES AND TWISTED CURVES; 2 hours a week, second half-year.

ALGEBRAIC INVARIANTS; 2 hours a week, first half-year.

It will be observed that the first course in each group is the same; that course alone is given annually, while

the other courses are given but once in two years. It is expected that every student will take each course (unless he has already completed an equivalent course elsewhere) in the earliest year of his residence in which it is given. These courses are briefly described in the *Third Report of the President and Departments* (April, 1893). Their chief object is to make the student familiar with the various methods of mathematical research and the concepts of mathematical thought at the present day. Thus, for example, the conic sections and quadric surfaces are treated by modern methods from the beginning, with adequate consideration of the discoveries of the great geometers of recent times. The usual college courses in the theory of algebraic equations, analytic geometry, and the differential and integral calculus furnish all the necessary preparation for these introductory courses, although it is very desirable that the student be acquainted with the properties of determinants and their application to the solution of linear equations, and with the methods of solving differential equations of the simpler types.

A *Seminary* will be conducted in connection with each group, in which the students will be exercised in individual investigation and the oral presentation of results. The literature of the topics discussed will here receive adequate attention.

Special advanced courses, open to such as have nearly or quite completed the introductory courses, are given annually in subjects varying with the interests of the instructors and the needs of the students.

Each advanced student is placed under the supervision of one of the instructors for guidance in the original investigation of some special topic; the successful issue of this investigation may furnish material for the dissertation required of a candidate for the degree of Doctor of Philosophy.

For the academic year 1894-95, the following courses are offered :

BY PROFESSOR STORY.

Advanced courses:

RATIONAL AND UNIFORM TRANSFORMATIONS OF CURVES AND SURFACES; 4 hours a week, first half-year.

SEMINARY FOR ADVANCED STUDENTS; through the year.

THEORY OF FINITE AND CONTINUOUS GROUPS; 3 hours a week, second half-year.

Introductory course (of Group A):

MODERN SYNTHETIC GEOMETRY; 2 hours a week, second half-year.

BY ASSISTANT PROFESSOR TABER.

Introductory courses (of Group A):

ANALYTIC GEOMETRY OF CONIC SECTIONS, QUADRIC SURFACES, AND HIGHER PLANE CURVES; 3 hours a week, through the year.

THEORY OF FUNCTIONS OF REAL AND IMAGINARY VARIABLES, AND DEFINITE INTEGRALS; 3 hours a week, through the year.

A SEMINARY in connection with these introductory courses; through the year.

BY M. DE PEROTT.

Advanced course:

RIEMANN'S SURFACES AND ABELIAN INTEGRALS; 2 hours a week, second half-year.

Introductory course (of Group A):

THEORY OF NUMBERS; 2 hours a week, first half-year.

Other advanced courses may be announced later.

For further details concerning the department (members and courses of instruction in past years, general policy of the department, library facilities, and apparatus), see the *Third Report of the President and Departments*, pp. 17-63.

II.

PHYSICS.

This department is under the direction of ASSISTANT PROFESSOR ARTHUR G. WEBSTER, Ph. D., who will regularly deliver, with a period of either two or three years, the following cycle of courses:—

- (1) DYNAMICS. — GENERAL METHODS, CANONICAL EQUATIONS, SYSTEMS OF PARTICLES, RIGID BODIES.
- (2) ELASTICITY, HYDRODYNAMICS, OSCILLATORY AND WAVE MOTION, DYNAMICAL BASIS OF SOUND AND LIGHT.
- (3) OPTICS.—Physical and Geometrical.
- (4) THERMODYNAMICS, KINETIC THEORY OF GASES.
- (5) POTENTIAL, ELECTRICITY AND MAGNETISM.
- (6) THE PARTIAL DIFFERENTIAL EQUATIONS OF MATHEMATICAL PHYSICS. Laplace's Equation, Equation of Thermal and Electrical Conduction, Equation of Wave Motion, Telegrapher's Equation, Developments in Series. Legendre's, Laplace's, Bessel's, and Lamé's Functions.

The courses for the year 1894-95 will be 1, 2, and 5. In addition to the above regular courses, advanced courses will, from time to time, be given on such subjects as Attraction of Ellipsoids, Figure of the Earth, Theory of Tides, and Theory of Sound.

The aim of the department is to ensure in the students some acquaintance with all the various fields of experimental physics, to develop in them the power of exact

measurement, to accustom them to exact reasoning from experiment to theory, and to encourage original research conducted on a sound basis. To this end students will be put to work in the laboratory upon experiments of sufficient difficulty to give them skill in measurements of precision, and to enable them to become familiar with the precautions and corrections necessary to be employed in exact work. After a sufficient amount of experience has been gained, and the student has shown himself to be possessed of sufficient originality to warrant independent investigation, he will be encouraged to take up for himself an original research in the hope of making a personal contribution to science. In this research, he will at all times have the benefit of the direction and advice of the professor.

In the belief that no sound knowledge of physics is at the present day possible without a clear appreciation of the means of expressing facts in accurate form, from which exact deductions may be drawn, much stress is laid on the acquisition of familiarity with the application of mathematical analysis to physics, and the courses of lectures are shaped with that end in view. These aim to give the student some acquaintance with the whole field of theoretical physics, to familiarize him with those general methods that appear in the various branches, and to show him how he may avail himself of them in practice. It is the constant endeavor in the lectures to bring out the physical essence that is concealed in the formulæ, in order that the student may recognize not merely the formula, in whatever department of physics it may occur, but the physical truth involved. As an instance, may be

mentioned the treatment of the partial differential equation of Laplace, whose meaning, whether in connection with distributions of Newtonian force, with the steady flow of heat, the steady flow of electricity, certain cases in hydrodynamics and sound, or in the theory of magnetic and electric induction, is physically the same, and indicates what was termed by Faraday the tubular, or solenoidal distribution of a vector. Further examples are furnished by the geometrical properties of linear vector functions, of so frequent occurrence, and by the properties of such vector functions that one represents the "spin," or "rotation," of another.

Before all things, however, are made prominent the idea of Energy and its laws, so that in each department the subject is developed as far as possible from the mathematical expression of the energy involved. Physics may be defined as the Science of Energy, and it is attempted, so far as possible, to make each portion of mathematical physics depend upon simple dynamical principles.

It should be urged upon intending students to prepare themselves, not only in ordinary laboratory measurements, but also in mathematics, the lack of proper mathematical preparation being a serious drawback to the appreciation of the lectures. In particular may be recommended for study not merely those portions of the Calculus which deal with the working out of many indefinite integrals, etc., but the theoretical portions which deal with the ideas of partial derivatives, definite integrals, and their practical manipulation, together with enough analytic geometry to involve the

properties of lines and *surfaces* of the second order, and a fair amount of the elements of determinants. As suitable text-books for preparation, may be recommended to the student Greenhill's, Williamson's, or Byerly's Differential and Integral Calculus, W. B. Smith's Analytic Geometry, and Hanus' Determinants.

A fuller account of the above courses of lectures, as well as a description of the facilities of the department, and a statement of the requirements for the Doctor's degree, may be found in the *Report of the President and Departments* for 1893.

III.

CHEMISTRY.

The Department of Chemistry offers to the student who is prepared to begin graduate work a series of regularly recurring laboratory and lecture courses, so combined with special advanced courses of a less permanent character that all graduate subjects required in the examination for the Doctor's degree will be presented within the space of two years. The laboratory courses and lectures on Organic and some branch of Theoretical Chemistry will be given each year. The special courses will vary from year to year.

LECTURE COURSES FOR 1894-95.

I. ORGANIC CHEMISTRY.—Methods of organic analysis and molecular-weight determination, physical properties of organic compounds, chemistry of the aliphatic compounds and of bodies containing the simpler rings; chemistry of the aromatic compounds, including the derivatives of pyridine and quinoline and the terpenes. Two lectures a week during the whole year.

II. RECENT HISTORY OF CHEMISTRY. — After a few introductory lectures on the earlier history of chemistry, special attention will be given to the development of chemical theory since the year 1840. The history of chemical instruction will be among the topics discussed. A limited amount of semi-nary work will accompany the lectures. One lecture a week during one half-year.

III. CHEMISTRY OF THE NON-METALS. — An advanced course, with special reference to recent work. One hour a week for one half-year.

IV. JOURNAL MEETINGS, in which important contributions to the current chemical literature are reported and informally discussed, will be held once a week throughout the year.

LABORATORY COURSES.

As a rule only such men will be admitted to this department as have already completed a good college course in Chemistry, and are practically acquainted with the ordinary analytical methods; but since the majority of our colleges do not yet give sufficient training in the methods employed in making organic preparations and analyses to render it possible for their graduates to begin upon research work in Organic Chemistry immediately, the following introductory laboratory courses (V.), — which are also suitable for minor subjects, — have been instituted, and are offered yearly:—

V. (a) QUANTITATIVE ANALYSIS.

(b) MOLECULAR-WEIGHT DETERMINATION.

(c) ORGANIC PREPARATIONS.

VI. CHEMICAL RESEARCH.— As soon as a student has obtained the necessary preliminary training in the subjects represented in course V., he may begin upon some scientific research under the direction of an instructor. The subject chosen for investigation may originate with the student, or may be proposed by the instructor, but must be one that meets the approval of the head of the department. When sufficient material for a satisfactory dissertation has been collected and the other requirements have been fulfilled, the candidate for the degree of Ph. D. may pre-

sent himself for examination. The time required for this course varies much with different students, but is usually at least two years, when 30-40 hours are spent in the laboratory each week.

The laboratory and library are open at all hours during the day, and afford every facility for advanced work. An account of the past work and present facilities of the Chemical Department may be found in the *Report of the President and Departments of Clark University*, for 1893, pp. 79-90.

IV.

BIOLOGY.

PROGRAMME OF WORK FOR YEAR 1894-95.

DR. HODGE will offer the following courses :

I. GENERAL BIOLOGY. — This course is intended to give in general outline the fundamental principles of biological science. The most general classification of plants and animals will be given with description of structural and physiological characteristics, through a series of typical organisms. The topics: origin of living matter, organization, growth and reproduction, heredity, differentiation and evolution will be given special prominence throughout the course. One lecture weekly, October to January. Laboratory work will be arranged to suit the requirements of those taking the course.

II. COMPARATIVE STUDY OF NERVOUS SYSTEMS AND SENSE ORGANS. — The point of view of this course will be both anatomical and physiological. It is intended to begin with a study, as far as possible comparative, of the structural elements of the nervous system in both invertebrates and vertebrates. Following this, it is proposed to consider the structure and functions of the nervous system in a series of animals, beginning with the cœlenterata and ascending through the mollusca, vermes, tunicata, arthropoda and vertebrates. The course will be illustrated, so far as possible, by diagrams, models, dissections and experiments. One lecture weekly throughout the year.

It is desired in connection with the above courses to hold a seminary in the history of biological science, to meet one

evening weekly for the first half-year. The special aim of this shall be, not so much to cover the entire field, but to study methods of biological research as exemplified in the work of the men who have achieved epoch-making advances in the science. Papers may be prepared by members of the seminary, and these will naturally form a nucleus for general and informal discussion.

PHYSIOLOGY AND NEUROLOGY.

It is intended to arrange physiological courses in such a manner that the general field may be covered in two years. This will leave the student free to devote his entire time during the third year to special study in the literature of the science and to the prosecution and completion of his thesis work.

The general subject will include lectures, reading courses, demonstrations and laboratory work in the following lines :—

1. Muscle and nerve.
2. Nutrition, including digestion, blood and lymph, circulation and respiration, and excretion.
3. Brain.
4. Skin and sense organs.
5. Reproduction.

During the work in each of these divisions, the microscopical structure of the organs concerned as well as the physiological chemistry connected with their action, will receive special attention.

Courses in physiology for the year 1894-95 will be offered as follows :—

III. NUTRITION, consisting of division 2, above. The course will extend throughout the year, and consist of lectures, dem-

onstrations and laboratory work, arranged to meet the requirements of members of the department.

IV. REPRODUCTION.

In addition to the above the following special courses will be offered :—

V. EMBRYOLOGY OF THE HUMAN BRAIN AND SENSE ORGANS.—Six lectures, with demonstrations and literature.

VI. CEREBRAL LOCALIZATION.—Six lectures to be given near the close of the year. The subject will be treated in the order of its historical development.

VII. MUSCLE AND NERVE PHYSIOLOGY.—This subject will not be repeated, in extenso, until 1895-96; but in case there is demand for it, a limited number of lectures and demonstrations will be given during the spring of next year.

VIII. PRACTICAL HISTOLOGY OF THE NERVOUS SYSTEM.—A purely laboratory course, with such directions and conferences as may be required by individual students. Considerable latitude will be given, so that those who wish may make it a comparative study by way of supplementing Course II., or devote their time to special problems.

EXPERIMENTAL WORK.

Laboratory work in both physiology and neurology will be arranged to suit the needs and purposes of each member of the department. As soon as practicable each student is expected to undertake an original research. It is hoped that men coming to the laboratory to study will have problems in which they are already interested. In case, however, they have not, work adapted to their qualifications will be assigned. A considerable amount of valuable material has already accumulated in the laboratory, and is waiting to be

worked up. A course in biology, such as is now given in the undergraduate department of many of our colleges and state universities, is sufficient to fit students to begin laboratory work here.

JOURNAL CLUB. It is intended to hold weekly journal club meetings, if possible, for the purpose of reporting and discussing important articles in the current periodicals.

V.

PSYCHOLOGY.

379

A complete course in Psychology at Clark University includes the following subjects:—

I. Anatomy and physiology of the brain and spinal cord; senses; and other parts of the body, especially the muscles; the organs of the will, so far as they affect psychological powers and processes. For this a special laboratory is equipped. See Dr. Hodge's announcement.

II. Physiological and experimental psychology, including Reflex Action; Fatigue and Rest; Sleep; Hypnotism; Automatism; Temperaments; Interaction of mind and body generally. Laboratory methods and apparatus for the study of the Senses, Reaction-Times, Memory and Attention. For this a special laboratory is equipped. See Dr. Sanford's announcement.

III. Abnormal and morbid psychology, as nature's experiments, *e. g.*, border-line phenomena as seen in neurotic people, prodigies and geniuses; Defectives, such as the blind, deaf, criminal, idiotic; Mental and nervous diseases, epilepsy, phobias, neurasthenia, hysteria; Morbid modifications of will, personality and emotion, etc. Special clinical facilities for this work are open to the department in the hospitals and other institutions of the city. See Dr. Hall's clinic and lectures below.

IV. Anthropological psychology; Myths, Custom and Belief, Comparative Religion and Psychology of Religion, Primitive Art, and the study of the life of savages and children; Adolescence and senescence; physical measurements

illustrating laws of growth in size and power, etc. See Dr. Chamberlain's laboratory and courses.

V. *Æsthetics and Ethics*, the psychology of music, painting, literature, the phenomena and laws of volition and morality.

VI. History of psychology and philosophy, including the chief culture institutions, science, medical theories, Christianity, and education generally.

VII. Applications of psychology; pedagogy, including mental and moral hygiene and regimen, school organization and methods from kindergarten to university; the sexual problem; defectives, etc. Dr. Hall's and Dr. Burnham's courses.

The aim of the Psychological Department is to cover this field as well as its instructors are able to do in two or three years.

For a full statement of what has been done in this department from the opening of the University down to its date, see the *Report of the President and Departments*, April, 1893.

During the academic year 1894-95, the following courses will be given:—

PROFESSOR G. STANLEY HALL'S COURSES.

I. CONTEMPORARY PHILOSOPHY, including logic, ethics, psychology and allied branches. In logic the work of the chief writers of the last few decades will be described, and the logic of the methods of the different branches of science will be characterized. In ethics and psychology the survey will include concise accounts of more recent books, men, and conclusions. There will be throughout reference to the work of the two previous years on the history of philosophy, and incidental reference to current and desirable modes of teaching each philosophic discipline.

II. MORBID PSYCHOLOGY. — Each of the chief forms of mental alienation will be characterized in connection with clinics held at the asylum. Special reference will be had to symptoms which border upon normal psychic life, and are therefore more common with reference to the utilization of these studies in education.

III. A SPECIAL COURSE, with experimental demonstrations covering the psycho-physics of the five senses, and time and space. For this course the resources of the laboratory will be fully utilized, and practice work given.

IV. EDUCATION. — The work of the next year will consist largely of a summary of what is known of the nature of childhood and youth as applied to the organization and curricula, branch by branch, of school and college.

V. THE SEMINARY will be organized and its work shaped, as heretofore, by the needs and wishes of those who may be admitted to it.

VI. RESEARCH WORK in library, school and laboratory, upon problems carefully prepared beforehand with the coöperation of Drs. Sanford and Burnham, will be suggested, and aid offered to all who desire and are found qualified. To this great importance is attached, and special individual coöperation is regarded by all the instructors of the department as a prime object in their work.

VII. STUDENTS' LECTURE COURSES.—Students usually give one or more lectures, open to members of the University, upon topics to which they have given particular attention during the year. These courses have been both valuable and attractive.

DR. SANFORD'S COURSES.

A. LECTURES ON RECENT PSYCHOLOGY AND PSYCHOLOGISTS.—The object of this course will be: first, to present a concise account of the work of typical psychologists since Kant; and second, to sketch the development and solution, so far as any has been reached, of typical psychological prob-

lems. It is hoped by this means to make clear both the present state of psychological science and its relations to the past.

B. A PRACTICE COURSE IN PSYCHOLOGICAL EXPERIMENTATION.—This course will, during the greater part of the year, follow the lines laid down in Dr. Sanford's "Course in Experimental Psychology." After the student has become somewhat experienced in laboratory work, he will be given a problem for experimental solution under competent direction.

C. ADDITIONAL LECTURES may be given upon topics not treated in Course A.

DR. CHAMBERLAIN'S COURSES.

GENERAL, embracing: (a) HISTORY, scope and relations of the science of Anthropology. (b) PHYSICAL ANTHROPOLOGY. Problems, investigations, results, laboratory work. (c) ETHNOGRAPHY. Races and race-origins. (d) ETHNOLOGY, including sociology; origin and development of the arts and sciences; mythology; folk-lore; religions. (e) LINGUISTICS. Race and language. Origin and development of language and of languages. Psychology of language. Gesture-speech and written language. Comparative linguistics. Comparative literature. (f) CRIMINAL AND PATHOLOGICAL ANTHROPOLOGY. Ethnic morals. (g) HISTORICAL AND ARCHÆOLOGICAL. Primitive man and primitive culture. One hour a week throughout the year.

And the following brief special courses:

A. ANTHROPOLOGY AND ETHNOLOGY OF SEX. History and sociology of woman. Woman in art, religion, civilization, etc.

B. THE CHILD AMONGST PRIMITIVE PEOPLES.

C. COMPARATIVE MYTHOLOGY of America and the Old World.

D. PSYCHOLOGY OF PRIMITIVE LANGUAGES.

E. COMPARATIVE LITERATURE. The beginnings of art in language.

F. THE ÆSTHETICAL IDEAS OF PRIMITIVE PEOPLES.

The lectures in anthropology will have special bearing upon the courses in psychology and pedagogy in the University, as may be seen from the outline given above.

From time to time reviews of the most important current literature will be made and students acquainted with the best contributions to anthropological science in the various foreign languages.

The American Journal of Psychology is published by this department, and is in part designed as a medium of publication for the work of members of it.

VI.

EDUCATION.

This has been made a sub-department and now offers a course which can be taken as a minor for the degree of Doctor of Philosophy. Its work is in the closest connection with the work in psychology and anthropology, and in part based on these. The work in this department is intended to meet the needs of the following classes of men :

First. Those intending to teach some other specialty, but who wish a general survey of the history, present state, methods, and recent advances in the field of university, professional and technical education.

Second. Those who desire to become professors of pedagogy, or heads or instructors in normal schools, superintendents, or otherwise to become experts in the work of education.

The programme of the Educational Department includes courses upon the following subjects :—

I. (a) CHILD-STUDY. (b) EDUCATIONAL PSYCHOLOGY. (c) SCHOOL HYGIENE.

II. (a) PRINCIPLES OF EDUCATION. (b) HISTORY OF EDUCATION AND REFORMS. (c) METHODS, DEVICES, APPARATUS ETC.

III. (a) ORGANIZATION OF SCHOOLS IN DIFFERENT COUNTRIES. (b) TYPICAL SCHOOLS AND SPECIAL FOUNDATIONS.

(c) MOTOR EDUCATION, including manual training, physical education, etc. (d) MORAL EDUCATION. (e) IDEALS.

IV. HIGHER EDUCATION, including university work, technical education; training in law, medicine, and theology; recent progress, present state and prospects of the most advanced education in different countries, including our own.

The courses in education for 1894-95 will be as follows :—

PROFESSOR G. STANLEY HALL'S COURSES.

THE NATURE OF CHILDHOOD AND YOUTH. Cf. Psychology IV.

ORGANIZATION AND CURRICULA OF SCHOOL AND COLLEGE.

DR. BURNHAM'S COURSES.

A.—PRINCIPLES OF EDUCATION.—This course involves the study of important chapters in the history of education and an account of a few representative educational leaders—Plato Erasmus, Montaigne, Luther, Comenius, Rousseau, Pestalozzi, Froebel, Kant, Fichte, Herbart. Educational ideals. The state and education. The field of scientific study in education. Present problems and tendencies. Once a week, half a year.

B.—EDUCATIONAL PSYCHOLOGY.—Some of the most important chapters in psychology in their educational aspects, especially habit, attention and memory. Diseases of memory, experimental investigations and methods of study in relation to memory; education of the senses; judgment, will, feeling, emotion in relation to moral training; education in productive activity. Once a week throughout the year.

C.—SECONDARY EDUCATION.—This course will involve a general study of aims and methods in the different subjects of secondary instruction, discussion of the report of "The Committee of Ten," and comparisons with the French and German programmes for secondary schools. The present problems of secondary education in different countries will also be discussed. Once a week, half a year.

The work of the *Seminary*, once a week throughout the year, will be, for the most part, adapted to individual students. It is hoped that each student will select, after conference with President Hall and Dr. Burnham, a topic for special investigation. The results of such studies may be published.

The courses as announced above may be modified somewhat as the needs of the students or other circumstances may require.

The library of the department is especially rich in foreign educational literature, and considerable illustrative apparatus has been collected. The Worcester Public Library and the library of the American Antiquarian Society are also accessible to students.

The *Pedagogical Seminary* is published by this department and offers facilities for printing digests, reviews and more valuable papers prepared by the members of the department.

For a fuller account of the facilities and history of this department, see the *Report of the President and Departments*, 1893.

LIBRARY.

The University Library now contains 15,500 bound volumes and 1,500 pamphlets, and the reading room receives 239 journals. With the exception of 3,200 Congressional publications and other contributed volumes, the library and the journals represent chiefly the five departments.

The books are grouped as follows:—

A	WORKS OF GENERAL REFERENCE.	I	PSYCHOLOGY.
B	JOURNALS.	J	PHILOSOPHY.
C	MATHEMATICS.	K	ETHICS.
D	PHYSICS.	L	CRIMINOLOGY.
E	CHEMISTRY.	M	ANTHROPOLOGY.
F	ZOÖLOGY.	N	EDUCATION.
G	PHYSIOLOGY.	O	BOTANY.
H	PATHOLOGY.		

Books not included under any of these subjects are grouped as Miscellaneous, and marked according to their room, case, tier and shelf. They comprise in addition to Congressional publications, bound files of magazines, several score of rare old books, a collection of art publications, travels, complete works, sets of reports, histories, biographies, etc.

The library of the University at present consists of six rooms: I. The large general room, containing A, B,

C, D, F, G, H, I, J, K, L, M, and O. II. The journal room. This contains chiefly current numbers of journals and books of reference. The journals are arranged on broad shelves on each side of the room for ready inspection. III. The educational room. This contains all the educational works except state and city reports and college publications, which have a place and a catalogue by themselves. IV. Chemical Library room, containing both the books and periodicals in that department and labeled E. V. A small store room for books not yet placed on the shelves or catalogued. VI. A small room for duplicates, unbound copies of journals, etc. Besides the subject classification, books are arranged in cases, tiers, shelves, etc.

All the privileges of the library are open to all appointees of the University alike.

The library is open from 8 A. M. to 6 P. M., and each member of the University has direct access to every book and journal.

Outside the University are found :

The Library of the American Antiquarian Society, organized in 1812, and containing over 100,000 volumes, is accessible to all members of the University.

The Worcester Public Library, containing about 360 periodicals and 93,000 volumes, has supplemented the scientific publications purchased by the University and all its privileges are accessible without charge.

A Medical Library of 8,000 volumes is also accessible.

By the courtesy of the Librarian of Harvard University and of the Surgeon General's at Washington, books from the libraries under their charge are sent to the Uni-

versity for a limited time ; and by the courtesy of S. S. Green of the Worcester Public Library, all the resources of that institution and its facilities for borrowing from distant libraries are available to all members of the University.

LIBRARY RULES.

1. No loud talk is allowed in any part of the library or reading room.

2. Every book shall be returned at the end of three weeks from the time at which it was taken out ; at this time it may be renewed for three weeks, unless wanted.

3. Any book may be called in at three days' notice at the discretion of the Secretary of the Library Committee.

4. Any member of the staff may reserve from circulation such books as he deems necessary in connection with the courses given in his department ; and these shall be placed by themselves and marked "reserved."

5. Current numbers of periodicals shall not be taken out until they have been in the library two weeks.

6. Reserved books and current numbers of periodicals, exempt from circulation, may be taken out after 5.30 P. M., but must be returned before 9 o'clock the next morning, excepting that such books and periodicals may be taken out on Saturdays at 12 M. and may be kept until 9 o'clock the next Monday morning.

7. All dictionaries, cyclopædias, and books of general reference, are permanently reserved.

8. Books of great value may be taken out only by special permission.

BY-LAWS.

The President of the University shall preside on all public academic occasions, shall direct the official correspondence, study the wants and interests of the whole University, and exercise a general superintendence over all its concerns. His first care, and that of the authorities of the University, shall be the departments already established, and next those closely related to them ; but no other department shall be established until those already introduced have been brought to the highest state of efficiency then possible. All acts, however, which shall involve the expenditure of money in the administration of the University's affairs, shall be subject to the approval of the Board of Trustees or the Finance Committee for the time being.

As the efficiency of the University depends chiefly upon the quality of its Faculty, the Board of Trustees will hold the President to a strict but reasonable accountability for the fidelity and ability of each instructor. The President only shall have the power to select and appoint all officers of instruction, subject to the approval of the Board of Trustees. To make wise and well considered appointments, to maintain harmony within the Faculty, and to increase their efficiency in research and instruc-

tion, shall be his most important duty. If at any time the President shall be negligent in the discharge of these or other duties, or is from any cause disabled from discharging them, they may be exercised by the Board of Trutees.

The President of the University shall be the medium of communication between the Trustees and instructors, individually and collectively, upon all matters within the field of action of either body. He shall attend all meetings of the Board of Trustees, of which he shall be notified, and shall participate in their deliberations, but without the power to vote. All complaints and requests from members of one body to the other shall be made through him.

The President shall call and preside over all official meetings of the instructors, and a record of their proceedings shall be kept. These records are in no case to be made known to others than the Trustees. They shall always be in the custody of the President, but may be inspected by the Trustees, or either of them at any time.

The President of the University, in the absence of the Trustees or Finance Committee, shall have the entire direction and control of the persons employed about the University, and not engaged in the work of instruction; the duties of all such persons shall be assigned, and they shall be appointed or removed by him, subject to the approval of the Finance Committee.

No instructor shall order any books or apparatus, or anything connected with the work of instruction, with-

out the approval of the President. No expense for the care of buildings or grounds, nor for alterations or repairs within and upon the same, shall be made without the approval of the Board of Trustees or Finance Committee, such alterations or repairs in no case to exceed the appropriations made for that purpose. If the Trustees, or Finance Committee, or any person shall make contracts in behalf of the University without authority, the officer or person making such contract shall become individually responsible therefor.

Each instructor shall give stated lectures to however few. He shall actively and zealously strive to maintain the highest possible standard, shall work in a spirit of hearty sympathy and coöperation, and shall encourage research by precept, and if possible, by example.

The foregoing By-Laws are intended to embody the provisions contained in a vote passed by the corporation on the twenty-third day of May, A. D. 1889, upon the motion of Judge Devens. If at any time hereafter any discrepancy shall be found to exist between the two, said By-Laws shall be so far modified as to conform to the provisions of said vote.

No instructor shall engage in any outside professional or technical pursuit without the approval of the Board, the Finance Committee or the President.

These By-Laws, or any one of them, may be changed, amended or repealed by a vote of three-fourths at least of the Trustees at any meeting of their Board duly called, notified and held for that purpose.

REGULATIONS.

1. All requisitions for apparatus and books must be made through the University office upon printed blanks provided for that purpose, and, except in the case of docents, signed by a member of the staff.

2. So far as possible orders for only the kind and amount of apparatus certain to be used during the year shall be placed; nothing shall be ordered for future years, and apparatus for research shall take precedence over that of teaching and illustration only.

3. A book shall be kept for each department containing a complete list of apparatus and supplies, with itemized cost. With the aid of this book a complete inventory of the stock shall be made once a year and whenever else the President shall direct.

4. Requisitions for repairs, furniture, plumbing and work about the buildings must be made in writing and with detail, and must be approved by the Building or Finance Committee, or such person or persons as they may authorize. When once thus passed upon, no change involving additional expense can be made in the requisition without the consent of the Finance Committee.

5. No unappropriated rooms and no part of the University grounds, shall be used for any purpose, and appropriated rooms shall not be used for other purposes than the stated University work for which they were intended, without previous permission from the office.

6. Unless for special reasons, absence of instructors from their stated exercises or from town for two consecutive week days, in term time, should be announced

at the office, and for longer absence permission should be obtained beforehand.

7. The Trustees desire that no instructor, docent or fellow shall enter upon other engagements outside his proper work in the University of a kind or amount likely to lessen his full efficiency for science within the University.

The following additional rules were passed by the Board of Trustees, at a meeting held April 4th, 1891, to take effect for the next academic year :

8. Appropriations shall hereafter cover all apparatus and supplies of whatever nature for laboratories, for demonstration or illustration ; all metal and carpenter work connected with the scientific activity of each department, and every form of special service. Appropriations, however, shall not hereafter cover books or journals, which shall be submitted to the Library Committee.!

9. The several appropriations made to individual instructors and others shall be the full and fixed limit of the liability of the University, to be on no account transcended, and for every excess over the appropriations, from whatever cause, the instructor making the order shall be personally responsible.

10. No order for any purpose shall be paid by the University, whether on appropriations or for general supplies, that has not passed through the University office.

PUBLICATIONS CONNECTED WITH THE UNIVERSITY.

I.—THE AMERICAN JOURNAL OF PSYCHOLOGY.

This *Journal* was commenced in November, 1887, and is edited by G. Stanley Hall. Each volume contains four numbers of about 150 pages each. Besides original articles, about half its space is devoted to careful digests of the important literature in its field. Price, \$5.00 per volume; single numbers, \$1.50. J. H. Orpha, publisher, Worcester, Mass.

II. The First Official Announcement was issued May 23d, 1889.

III. The Addresses and Exercises at the opening of the University on October 2nd, 1889.

IV. Register and Second Official Announcement, May, 1890.

V. First Annual Report of the President to the Board of Trustees, October 4, 1890. This contains the first statement of the plan, aims and methods of the University, and reports upon the original investigation of each department from each member who has made such.

VI. Register and Third Official Announcement, April, 1891.

VII. Second Annual Report of the President to the Board of Trustees, September 29, 1891.

VIII. Register and Fourth Official Announcement, April, 1892.

IX. Third Annual Report of the President to the Board of Trustees, April, 1893. Contains a full report

of the work done in each department since the opening of the University; pp. 168.

X. Register and Fifth Official Announcement, May, 1893.

XI. Programme of the work of the Summer School at Clark University (July 16 to 28, 1894).

XII. THE PEDAGOGICAL SEMINARY. This journal was begun in January, 1891, and is edited by the President of the University. It is an international record of educational literature, institutions and progress, and is devoted solely to the highest interest of education in all grades, with digests of important literature of all countries. Each volume contains from 400 to 500 pages. It is the organ of the Educational Department of the University. Price \$4.00 per volume. Single numbers, \$1.50. J. H. Orpha, publisher, Worcester, Mass.

